

PLAIN CONCISE  
PRACTICAL REMARKS,  
ON THE TREATMENT OF  
WOUNDS AND FRACTURES;  
To which is Added, An APPENDIX,  
ON  
CAMP AND MILITARY HOSPITALS;

PRINCIPALLY

Designed, for the Use of young Military and Naval Surgeons,  
in NORTH-AMERICA.

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By JOHN JONES, M. D.  
Professor of Surgery, in King's College, New York.

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MDCCLXXV.



TO

DOCTOR THOMAS CADWALADER,  
PHYSICIAN, IN PHILADELPHIA.

SIR,

**W**HILE speculative Philosophers are disputing about the origin of evil and foundation of morals, and furious bigots contending for different modes of faith, the practical good man will endeavour to employ himself in alleviating those evils which he finds incident to human nature, without too vain and curious an inquiry into causes, the nature and operation of which, lie far beyond the narrow limits of human understanding.

THE present calamitous situation of this once happy country, in a peculiar manner, demands the aid and assistance of every virtuous citizen; and though few men are possessed of those superior talents, which are requisite, to heal such mighty evils as now threaten the whole body politic with ruin and desolation; yet, every man has it in his power to contribute something towards so desirable an end; and if he cannot cure the fatal diseases of his unfortunate country, it will, at least, afford him some consolation, to have poured a little balm into her bleeding wounds.

INFLUENCED by these motives, I have endeavoured to select the sentiments of the best modern surgeons upon the treatment of those accidents, which are most likely to attend our  
present

present unnatural contest; and as many of the Gentlemen engaged in that service are young men, whose opportunities of instruction or practice, have been confined within narrow limits; I flatter myself, that such of them, at least, as are conscious of their own defects, will find in the piece, no unuseful guide. To you, whose whole life has been one continued scene of benevolence and humanity, the most feeble efforts to soften human misery, and smooth the bed of death, will, I know, be an acceptable present, however short the well meant zeal of the Author, may fall of his purpose. Nor will you suspect me of the vanity of supposing, I shall convey any thing new or instructive to men of knowledge and experience in their profession, much less to yourself, to whose excellent precepts, both in physic and morals, I owe the best and earliest lessons of my life; and if I have attained to any degree of estimation with my fellow citizens, it is with the most sincere and heartfelt pleasure, that I publicly acknowledge the happy source.—That your virtuous life may be long continued as a blessing to yourself, your friends and your country, is the ardent wish of your

Most obliged Friend,

and affectionate Kinsman,

JOHN JONES.

NEW-YORK, 12th OCTOBER, 1775.

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## THE INTRODUCTION.

To the STUDENTS, and young Practitioners  
in SURGERY, through all America.

GENTLEMEN,

**T**HE following remarks and observations were thrown together under the disadvantageous circumstances of ill health, and a variety of occupations, which allowed little leisure for composition, and I flatter myself the apparent necessity for some immediate production of this nature, will apologize for those defects which a discerning reader will readily discover: If any of you, by observing the following rules, should save the life, or even limb of but one citizen, who has bravely exposed himself in defence of his country, I shall think myself richly rewarded for my labour. In the mean time, instead of attempting an idle panegyric upon the most useful of all arts, permit me to point out to you some of the most essential duties and qualifications of a good Surgeon; the proper requisites of which respectable character, are only to be found in a liberal education, furnishing every means of acquiring that knowledge, which must be ripened by experience, and graced by the constant practice of attention, tenderness, and humanity. A judicious surgeon will always find his powers and abilities of  
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assisting the wretched, proportionable to the time he has spent, and the pains he has bestowed in acquiring the proper knowledge of his profession.—In most European countries, an invidious distinction has prevailed, between Physic and Surgery; but in this part of the world, the two professions are generally united;—indeed both the branches of medicine, are, in the very nature of things, so intimately connected, as not to admit of absolute separation, without manifest injury to each. As a curious and interesting fact in the history of Surgery may serve to illustrate this opinion, I hope a short digression will not be deemed wholly uninstruative, or foreign to the present purpose.

At the revival of letters in Europe, when a cultivation of the languages had opened the treasures of the Greek and Latin writers, there arose a number of great men, in all the different branches of science;—but what was very peculiar to the state of Surgery, particularly in Italy and Germany, is, that this science was cultivated and practised by the same men who studied and practised physic; so that the same persons were at once admirable Surgeons, and excellent Physicians; and it is precisely at this æra, that a crowd of celebrated men arose, whose works will forever do honour to themselves and their profession.

BUT it was not long before the operation of some of those passions which have so much influence in the affairs of mankind, occasioned the decline, and almost total extinction of Surgery.



gery. The exterior of this science, has nothing pleasing or attractive in it, but is rather disgusting to nice, timid, and delicate persons:—Its objects too, except in time of war, lying chiefly among the poor and lower class of mankind, do not excite the industry of the ambitious or avaritious, who find their best account among the rich and great; for this reason, those illustrious men who were at once great Physicians and Surgeons, abandon'd the most disagreeable and unprofitable part of their profession, to follow that branch alone, which at once gratify'd their ease, their avarice, and their ambition:—This regulation gave rise to the second state of Surgery. The medical Surgeons, in quitting the exercise of the art, retained the right of directing the barbers, to whom the operations and external applications of Surgery were committed: From this separation, the Surgeon was no longer one and the same individual, but a monstrous and unnatural composition of two persons; of a Physician who arrogated to himself an exclusive knowledge of science, and consequently the right of directing, and a Surgeon operator, to whom the mere manual part was committed.

THE danger of this separation of the science of Surgery from the art of operating, was not at first perceived. The great masters who had exercised Surgery as well as Physic, were still alive, and the dexterity they had acquired, was sufficient to direct and assist the automaton,

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or mere operator ; but as soon as this Hippocratic race of men, as Fallopius justly stiles them, were no more, the progress of Surgery was not only retarded, but the art itself was almost extinguished, little more than the bare name remaining—Hence that animated and affecting picture, which Cæsar Magatus, the Venetian Physician, drew, of the misery of those unfortunate citizens who languish'd without resource, under the most cruel and painful diseases which were formerly cur'd with certainty ; but the patients were then abandoned to their wretched fate, as the most favourable alternative ; for they could but perish by the severity of the disease, and they were sure to die, by the ignorance of their operator.

THE fatal consequences of a total separation of Physic and Surgery, are so strikingly exemplified in this remarkable epocha of the science ; that I think it may serve as a sufficient proof, of the erroneous conclusions of a late celebrated professor of Physic at Edinburgh, who in an excellent discourse upon the duties and offices of a Physician, is of opinion, that the art of Surgery would be more advanced, by confining the professors of it to mere manual operation, under the direction of an able Physician, than it could be by those who practise promiscuously the different branches of medicine.----It is with the utmost diffidence and reluctance, that I presume to differ with so truly liberal a character as that of Dr, Gregory, but as truth is the  
grand



grand object of our mutual inquiries, and that upon a subject the most useful and interesting to mankind, no names however great or respectable, should implicitly influence our researches. For this reason, though I readily grant that a division of the practical part of medicine into two different branches, may, by confining each to a more frequent attention to the same objects, produce a degree of perfection which a more promiscuous practice could never arrive at; yet I must at the same time declare, that I can almost as readily conceive the possibility of seeing a good play performed by Punche's company of Comedians, actuated by their director, as to see a number of Surgeon machines, perform difficult and delicate operations, under the directions of their medical masters.

In short, the variety of difficult operations, performed with such superior success and safety; by the present race of Surgeons, who are distinguished for their knowledge in every branch of medical learning, is an evident proof of the benefit resulting to operators from a more liberal mode of education; and I think it can no longer remain a doubt with any unprejudiced person, that an enlightened mind, united to the person of the operator, must and will constitute the most accomplished and successful Surgeon.

For these reasons, Surgery may, with great propriety, be divided into medical and manual;—the first comprehends an infinite variety of diseases, which require the assistance of both in-

ternal and external applications ;----the last is confined to those cases which admit of relief from the hand alone, or assisted with instruments.

HENCE it will appear very evident, how necessary it is for the student in Surgery, to make himself thoroughly acquainted with most of those branches of medicine, which are requisite to form an accomplished Physician.

BESIDES a competent acquaintance with the learned languages, which are to lay the foundation of every other acquisition ; he must possess an accurate knowledge of the structure of the human body, acquired not only by attending anatomical lectures, but by frequent dissections of dead bodies with his own hands.—This practice cannot be too warmly recommended to the students in Surgery : It is from this source, and a knowledge in hydraulics, they must derive any adequate notions of the animal œconomy or physiology. Chymistry and Materia Medica are very necessary to a right understanding of pharmacy or composition.—To these should be added some progress in the mathematics and mechanics, which I will venture to assert may be applied with much more utility and safety to the science of Surgery, than Physic. But there must be a happiness, as well as art, to complete the character of the great Surgeon.

HE ought to have firm steady hands, and be able to use both alike ; a strong clear sight, and  
above

above all, a mind calm and intrepid, yet humane and compassionate, avoiding every appearance of terror and cruelty to his patients, amidst the most severe operations.

FROM this short view of the nature and extent of the art of Surgery, it will evidently appear how necessary an early and diligent pursuit of those branches of knowledge, which are to lay the foundation of future eminence, is to the young student, who will not find it so easily attainable as the generality of pupils are apt to imagine. To be proficient in an art which requires reiterated experiment, and whose subject is liable to so much variation, not only requires a good deal of time, but much sagacity and judgment. The great variety of habits and constitutions, and the frequent complications of diseases with each other, constitutes an ample field of contemplation, which he who runs hastily through, will not be likely to reap much benefit from scampering round the wards of an hospital, and reading a general system of Surgery, are too often the best foundation for practice, which many gentlemen can boast; but if a man duly reflects upon the importance of that art, in the exercise of which, health and life, the greatest of human blessings are concerned, he will deem himself accountable for all errors, into which ignorance or inattention must infallibly betray him.

IN new settled countries however, where opportunities of improvement are not within the reach

reach of every student, many gentlemen are obliged to set out in practice, with such a stock of knowledge as they are able to acquire under the tuition of a single master, who may, himself, too often stand in need of instruction. To such gentlemen I would earnestly recommend a diligent, attentive, and repeated perusal of the best English practical writers, among which Mr. Pott, in my humble opinion, claims the first and most distinguished rank.—Mr. Bromfield's Chirurgical Remarks, contain a great deal of useful instruction upon some of the most interesting and difficult diseases in Surgery.—The writings of Mr. Sharp, Mr. Gooch, and Mr. White of Manchester, merit a very attentive perusal; and the Medical Observations of London and Edinburgh, abound with a great variety of useful and instructive cases, both in Physic and Surgery—Monsieur Le Dran, whose works are well translated into English, is the most celebrated writer amongst the French; his observations are the result of sound learning, and a prodigious experience of sixty years, both in the army, as well as capital of the kingdom; his last work entitled Consultations, is peculiarly designed for the assistance, and instruction of young practitioners in Surgery.—As to those gentlemen, who will neither read nor reason, but practise at a venture, and sport with the lives and limbs of their fellow-creatures, I can only with Dr. Huxham, advise them seriously to peruse the sixth commandment, which is, “Thou shalt not kill.”

# C H A P T E R I.

## OF WOUNDS in GENERAL:

26 **A** WOUND is very accurately defined by the great Boerhaave, to be a recent and bloody solution of the union of a soft part, by a hard and sharp body in motion, press'd against it, or resisting it." It is obvious from this definition, that the subject of a wound is a soft part, and we learn from modern anatomy; that the soft parts of a human body are a congeries of vessels of different kinds; and hence there can be no wound without a division of vessels of many different series: For no sanguiferous artery can be divided; without the vessels of almost every different kind being wounded; for the coats of this artery being made up of other smaller vessels; and these again of a still finer texture; till we come to the smallest; it is evident by a simple wound of a sanguiferous artery, the serous and lymphatic vessels are divided, with the membranes and muscular fibres which constitute the muscular coat of the artery; Hence it is obvious that a very slight wound may injure all the congeries of vessels of which the soft parts are composed.

Hence those actions are injured which depend upon the cohesion of the parts, and a determin'd circulation of liquids through the vessels.

These wounds therefore are mortal, which are inflicted in those parts, whose cohesion is  
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inseparable from life ; every wound therefore, which destroys the free influx of the blood into the heart, and its expulsion from it, must be inevitably mortal. For this reason, every wound of the aorta must be attended with inevitable death, as no assistance of art can possibly be applied to stop the hæmorrhage ; other wounds may, if left to themselves become mortal ; but by the timely help of art, the danger of death may be remov'd, as in wounds of the arteries of the limbs, where the tourniquet may be applied till the bleeding vessel can be taken up by a ligature ; and in the reports given in by Surgeons to judges of courts, these circumstances ought carefully to be adverted to, and distinguished. Many wounds also in themselves not mortal, may be rendered so by neglect or erroneous treatment ; this frequently happens to soldiers and seamen in the day of battle, when the multiplicity of cases prevents the Surgeons from paying a proper attention to all,—hence many die of hæmorrhages which might have been stopped, and extravasations under the cranium, which the application of the trepan might have relieved. Errors in practice have the same fatal consequence, persons falling into a deliquium, from a great loss of blood, who by proper nourishing broths, might have been recover'd, have lost their lives by an injudicious exhibition of spirituous liquors, which by their stimulus upon the vessels, produce fresh hæmorrhages.

The effects too of wounds are various, according to the variety of actions exercised while the

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the wounded part was entire; nor is there a less variety of names, forms and effects in wounds, arising from the diversity of the wounding cause,—and hence the incised, the contused, the lacerated, and the punctured wound.

If in a healthy and robust body, a wound is made in a visible place, not irrigated by any large artery; the following phenomena arise, provided the orifice of the wound is defended from the cold, from air and exsiccation.

First, the parts between which the wounding cause is forced, recede from each other more and more, though the cause is remov'd, unless in punctured wounds, which are very small. 2dly. The blood flows with more or less impetuosity according to the size of the wounded vessels; but by degrees stops spontaneously, the elasticity of the arteries contracting their bleeding orifices. 3dly. A sanguineous crust is formed in the cavity of the wound, the blood naturally coagulating, when extravasated, and acquiring a degree of dryness from the contiguous air. 4thly. A diluted reddish thin liquor flows from it, resembling the washings of the new kill'd flesh,—this happens from the contraction of the larger vessels, while the serous and lymphatic, discharge their contents. 5thly. The lips of the wound begin to look red, become præternaturally hot, painful, tumid, and retorted, while the bottom becomes more prominent, the fat rising into the aperture of the wound, and there degenerating. And 6thly. A slight fever, accompanied with  
thirst

thirst is excited—These latter symptoms happen only in pretty large wounds, but the former in all, where there is a proper degree of vital force; and hence Hippocrates tells us that, when severe wounds are inflicted, if a tumor does not succeed, it is a very bad sign,—and the same admirable old surgeon as well as Physician very justly lays it down as one of the most important rules in Surgery, “that on the third and fourth days, wounds are by no means to be disturbed; and that we are at this time to abstain from all searches with the probe, and every thing that may irritate them.”

7thly. About the fourth day, sooner or later, according to the age of the patient and heat of the weather, a white, pinguious, equal matter, called pus, is generated in the wound; and this produces very happy effects, by separating the lacerated vessels and extravasated fluids from the sound parts which then grow up a-fresh,—Hence laudable pus is esteemed by Surgeons the best of signs. 8thly. At this time the redness, heat, tumor, pain, retorsion of the lips, and fever, cease, or are greatly diminished; for all these symptoms arise in consequence of an obstruction in the circulation, from a contraction of the orifices of the wounded vessels, which a laudable suppuration removes; and this stage of the disease is called by Surgeons, the time of digestion.

9thly. The cavity of the wound is generally fill'd up with new flesh, whilst the margins becoming white, bluish, soft and equal are united. Lastly, the wound becomes dry, and is cover'd with a cicatrix or scar.”

From

From the preceding account of the progress of nature in the healing of wounds in healthy bodies, it may easily be perceived, how small a share art can justly boast in this very extensive branch of the diseases in Surgery. And yet, how many infallible, healing balsams, and wonderful nostrums have been and still are imposed upon the world, not only by Quacks and Empiricks, but too many, whose education and knowledge of the animal œconomy should render them incapable of low artifice, or ignorance of nature's admirable efforts for her own relief. It was this sensible and attentive observation of nature's operations, which rendered Hippocrates so judicious a Surgeon, without those helps which we derive from the great modern discoveries in Anatomy and Physiology; and the same good sense and observation, renders the practice of the present English Surgeons, particularly in wounds, so much more simple and plain, than that of the Surgeons of other nations.

Mr. Sharp, in his excellent introduction to the operations of Surgery, recommends nothing but dry, soft lint, to recent wounds, which is generally the best application through the whole course of the cure. At first, it restrains the hæmorrhage with less injury than any styptic medicines; and afterwards, by absorbing the matter, which is at first thin and acrimonious, it becomes, in effect, the best digestive: During incarnation, it is the softest medium that can be applied between the roller and tender granulations; and at the same time, an easy compress on the sprouting fungus.

For these reasons, I shall not recommend to you any ointments for recent wounds, unless some mild, soft one, to arm a pledget of tow, to cover the lint.

When a wound degenerates into so bad a state as to resist this simple method of treatment, and loses that healthy, florid appearance, which characterizes a recent wound; it is then denominated an ulcer, which is distinguished by various names, according to the different appearances of the sore, the peculiar habit of body, or particular disease, attending the patient. But as this branch of Surgery does not come within my present plan, I shall proceed to give you a short account of the usual division of wounds; previous to which, I beg leave to offer a few remarks upon the doctrine of inflammation; a subject, of which every person, who intends to practise Surgery, should endeavour to acquire just and accurate ideas; for from this cause a great many diseases arise, which require the assistance of chirurgical operations; and it is always more or less, the consequence of operations themselves, as well as of wounds, fractures, dislocations, and other accidents.

## C H A P T E R II.

### O F I N F L A M M A T I O N.

**W**ITHOUT entering into any minute physiological investigation of the theory of inflammation, which would be inconsistent

sistent with my present plan, I shall content myself with saying, that irritation and pain, however they may be occasioned, are at all times its immediate or proximate causes; and that, in most cases, if we can prevent pain we shall proportionably prevent, or at least lessen the succeeding symptoms of inflammation. This is to be done only by the immediate exhibition of sudorific anodynes, proportioned to the age and strength of the patient, and the severity of the complaint. Bleeding, gentle laxatives, warm baths, and soft cataplasms to the parts affected, will all contribute towards this most desirable purpose, and should never be omitted; yet without premising opium, they will seldom avail in preventing inflammation: Let it be carefully observed however, that I here suppose the Surgeon to be present in the first state of the disease, where prevention may be happily substituted for a cure.

In other cases, as frequently happens in the day of battle, when this timely application cannot be made; and when pain, continued for some hours, has already induced a degree of heat, tension, redness and swelling, a different mode of treatment becomes necessary; for although anodyne medicines may lessen the violence of the pain, they will not remove the symptoms already occasioned by it: In this case more copious evacuations, cooling medicines, a most exact diluting diet, and perfect quiet of body must be insisted on, by which means a great deal of the obstructing matter will be taken up by the absorbent vessels, and the remaining part be converted into pus.



A still different and more difficult task presents itself to the Surgeon, when any of the tendinous and membranous parts are injured; for though these substances have little or no feeling in a sound state, yet when they are diseased, they acquire a most exquisite degree of sensibility: And if to this third state of the nature of inflammation, we add a fourth, attended with fracture of the bones, it will comprise almost every circumstance relative to the subject in question. Here all the skill and attention of the Surgeon will be necessary to prevent, or alleviate the dangerous and too frequently fatal symptoms of convulsion, abscess, and gangrene, which a more violent inflammation induces in this species of wounds; where bleeding, joined to the general antiphlogistic method must be more rigidly insisted on,—all stimulating foreign bodies remov'd;—Sudorific anodynes exhibited according to the violence of the pain and urgency of the symptoms. Abscesses opened, and the first appearance of gangrene obviated, by a more cordial nourishing diet, spirituous fomentations, and a liberal use of the bark. The application of all which remedies will be particularly pointed out, in treating of compound fractures distinctly. In the mean time, I shall proceed to take some notice of the usual division of wounds.



## CHAPTER III.

## Of the DIVISION of WOUNDS.

**W**OUNDS have been generally divided into four different species, the incised, the punctured, the lacerated, and the contused; each of which, although they are all attended with a greater or less degree of the same symptoms, and require the same general treatment, have some peculiarities, which render this distinction both useful and necessary.

The simple incised wound, when unattended with any considerable hæmorrhage, or great loss of substance, is always to be healed by what Surgeons call the first intention; which consists in approaching the lips of the wound, until they come into the most exact contact, and preserving them in that situation, by suture or bandage, until the union is accomplish'd.

Whenever a wound will admit of this contact, by means of a sticking plaster, assisted with the uniting bandage; the use of a suture is unnecessary, and this is generally the case in superficial wounds, and even pretty deep ones, of the limbs, when made in a longitudinal direction, where the uniting bandage can be assisted with proper compresses. But many oblique wounds, of the body and face, particularly, will not admit of this mode of union;

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and the use of the future becomes absolutely necessary. That species of it usually employed in the union of common incised wounds, is called the interrupted, and is to be performed in the following manner.

After cleansing the wound from coagulated blood, and all foreign bodies; let your assistant approach the lips towards each other, and having measured the depth of the wound with your eye, pass your needle, previously dipt in oil, at such a distance from the edge of the lip, as will make it equal to the depth of the wound; and carrying it out at the same distance on the opposite side, you draw your ligature close enough to bring both lips into immediate contact, without wrinkling or puckering the parts, and then make a double knot: The number of stitches must be proportioned to the length of the wound. A good general rule will be, to use no more than are just necessary to bring the lips into exact contact, and this mode of passing the ligatures by describing a kind of semicircle, will answer that intention perfectly, by approaching the lips from the bottom of the wound to its external surface. A piece of adhesive plaster, embracing a large portion of the external integuments on each side, will contribute to preserve the parts in situ: The ligatures should be removed as soon as the union is completed, which generally happens either the second, or third day, often in twenty four hours.

Punctured

Punctured wounds, which do not penetrate into either cavity of the body, require no particular mode of treatment, unless they are deep and winding, in which case some dilatation of the external orifice becomes necessary, in order to discharge more freely any extravasated fluids, which might otherwise occasion troublesome and disagreeable abscesses.

Surgeons are not entirely agreed in the method of treating lacerated wounds; some advising a removal of the lips, particularly, when large, while others contend for their preservation;—however, as the skin, or common integument, is a most useful, as well as ornamental part of the human body, I believe it may be laid down as a very just and general rule, to preserve as much of it as the nature of the case will admit; we all know how readily, raw tender parts will unite; and wherever moderate bandage can be applied, there is a good prospect of success from the attempt, which should always be made:—If the torn lips are very unequal, they may be reduced nearly to the state of a simple incised wound, by the assistance of the knife; and a future will then not only forward the cure, but prevent deformity; which every good Surgeon will always endeavour to avoid.

Severe contused wounds have this peculiar circumstance attending them; that the vessels having intirely lost their tone, are no longer able to circulate the contained fluids, or take up what are extravasated by absorption, for which reason  
suppuration

suppuration must inevitably follow;—and when an opening has not been made by the accident, it is the Surgeon's duty at the proper time, to do it in the most advantageous manner, by making a large dependent orifice;—warm discutient fomentations, and spirituous embrocations, to attenuate the obstructing matter, and brace the relaxed, debilitated tone of the fibres, are very useful, and in common contusions, will be sufficient to answer every intention, without any opening at all.—It is very evident, that contused wounds, under the preceding circumstances, will not admit of the future with any degree of propriety, or prospect of success.

I scarcely need observe, that moderate evacuation, by bleeding, and gentle purging, together with a low diet, are, in these cases absolutely necessary.

Wounds of the tendons, with a cutting instrument, are now treated like other simple incised wounds; provided you can bring the extremities of the divided tendon into contact, and preserve them by means of a proper bandage, in that situation; no future is ever made use of. The tendo achillis is often united in this way, by bending the knee, and relaxing the flexor muscles of the leg, while the foot is extended and preserved in this situation, by a proper bandage.—Monsieur Le Dran recommends for this purpose, a leather knee piece, to the posterior, and inferior part of which, a strap, of a foot long

long, is fastened; then a piece of thin wood, being fixed to the sole of an old slipper, and one end of it projecting near three inches beyond the heel, with a short strap and buckle, to which that from the knee reaches, and admits of being drawn up sufficiently to bring the extremities of the divided tendon into perfect contact:---The external wound is to be defended with an adhesive plaster, and absolute rest enjoined, till the parts are united, which does not happen sometimes for several weeks, particularly, if any inflammation attends the wound.

## CHAPTER IV.

### Of Penetrating Wounds of the THORAX and ABDOMEN.

**W**OUNDS which enter either cavity, may be divided into three general classes, such as are mortal, such as are necessarily hazardous, and those which are accidentally so; and those distinctions are founded in the structure and office of the wounded parts, combined with the natural consequent symptoms, and the treatment of the Surgeon.

All wounds of the heart, aorta, cerebellum, medulla oblongata and receptaculum chyli, are justly deemed mortal, because those parts are immediately subservient to life; but those of the lungs, liver, intestines, kidneys, pancreas, gall bladder, large vessels, spleen, mesentery, bladder



bladder and stomach, are only hazardous in proportion to the nature of the offices they perform in the animal œconomy, and the degree of injury they have received; to which may be added, errors committed by the patient, or his Physician, by which a greater degree of fever, inflammation, and discharge are excited.

A short view of the nature and situation of wounded viscera, will shew us how little we are to expect from any external applications, unless when some particular viscus is protruded, through a large wound of the abdomen, and of which proper notice will be taken hereafter. The great and principal attention of the Surgeon, should be directed to the prevention or diminution of inflammation; therefore after a proper dilatation of the external orifice, which in punctured, penetrating wounds is almost always necessary, the patient should immediately lose as much blood as his strength will bear, and this from a very large orifice, by which means the hæmorrhage, if considerable, will be most effectually restrained. The bleedings should be repeated at short intervals, according to the nature and urgency of the symptoms; emollient glysters, cooling nitrous drinks, anodynes to assuage pain, a most rigid exact diet, consisting solely of thin diluting drinks, perfect quiet, and a posture which at once contributes to the patient's ease, and the discharge of any extravasated matter, constitute the other most essential aids, which we can call in to assist nature, to  
whose



whose admirable resources we must chiefly trust the rest of the cure.

Should any portion of the intestines or omentum, the usual parts protruded, be forced out, they ought as early as possible to be reduced, by placing the patient on his back, with his hips a little elevated, and then with the fore finger of each hand, gently and alternately pressing the protruded part into its proper place, but if such a degree of strangulation should attend, as to prevent this easy reduction, a sufficient dilatation must immediately be made, by introducing a director, on which Mr. Pott's curved bistoury with a button point, may be conveyed, and the enlargement performed without any difficulty or danger, unless from wounding some blood vessels, which a tolerable knowledge of anatomy will teach us to avoid.

A mortification of the omentum is sometimes the consequence of a long strangulation, in which case the mortified part may be removed with the knife, and the rest returned without making any ligature upon it; the external wound may be united by means of the interrupted suture, assisted with compress, bandage, and a suitable posture.

Penetrating wounds of the thorax, are in general pretty easily distinguished from the peculiar symptoms which attend them. The most remarkable of these, is the passage of air through the wound in respiration, and the expectoration of frothy blood from the lungs when they are wounded.

wounded. If the wound be made with a bayonet or small sword, the external orifice must be immediately enlarged, in order to give a free discharge of the blood lodged in the cavity. The bleedings must be proportioned to the degree of hæmorrhage, which, if violent, can only be restrained by large, and repeated venesections,—frequent doses of nitre, in barley-water, or flax seed tea;—an extreme cool regimen and perfect rest, even speaking should be absolutely forbidden.

An emphysematous tumor; arising from the insinuation of air into the cellular membrane, sometimes attends penetrating wounds of the thorax, and occasions very painful and troublesome symptoms, the proper treatment of which I shall refer to the chapter on gun-shot wounds, in which a fracture of the ribs has induced this particular complaint.

Wounds of the containing parts about the breast and belly, which do not penetrate the cavities, are often attended with severe, and sometimes dangerous symptoms. Bleeding and the general antiphlogistic method, will generally succeed in removing them. But the Surgeon is often puzzled to know whether a wound in the abdomen has penetrated the cavity, or not; for if none of the contained parts are injured, the symptoms may be so equivocal, as to render it very uncertain; nor is it of any great consequence to ascertain this matter, as the method of treatment in either case, is pretty much the same.

same. It is even very difficult in many cases, to determine precisely; which of the viscera are wounded, unless in some of the principal organs, such as the liver, stomach, or intestines; whose injured functions pretty plainly indicate the part affected; but the spleen, pancreas and mesentery, may be very considerably injured, without exciting any other than the general symptoms of pain and inflammation; and indeed it is of less consequence, with respect to the patient's treatment, than the Surgeon's prognostic, to find the exact seat of a wounded viscus. But as the reputation of a Surgeon depends greatly on a just prognostic, he cannot be too attentive in discovering the true seat of the injury, which alone can determine the degree of danger. For this purpose the patient during examination, should be placed as nearly as possible, in the same situation he was in at receiving the wound; every evacuation must be carefully examined; and the utmost regard paid to the peculiar symptoms, which attend the injured function of the different organs.

## CHAPTER V.

## On simple FRACTURES of the LIMBS.

**I**T might reasonably be supposed, that a branch of Surgery, which has been constantly practised by the ablest masters of the art, both ancient and modern, for above two thousand years, should be well understood, and long since brought to its utmost degree of perfection. This opinion, indeed has so universally prevailed, that the most ordinary country Surgeon has thought himself as well qualified to reduce a simple fracture, as the first man in the profession;—even the most illiterate mechanics, who make no other pretension to knowledge in Surgery, than what they assume from their pretended skill in bonesetting, put themselves on a footing with the most regular Surgeons in the reduction of fractures, and often obtain a higher degree of reputation in the art, not only from the vulgar, but even among the more enlightened and sensible part of mankind.

This strange infatuation is not altogether to be accounted for in the present case, from that strong desire of health and ease, which like the love of money, reduces all understandings to a level; but may in some measure be owing to that general error, which the regular professors of the art, as well as the most ignorant practitioners, have hitherto laboured under, with

with respect to the most proper and successful method of treating fractures of the limbs in general, and the larger ones in particular.

An implicit adherence to the opinions of others without exercising our own reason, has been the source of that blind attachment, which men in all ages have paid to the authority of names and characters, and the best understandings have been so much fettered by these shackles, as to overlook the most obvious truths, and even when some enlightened and liberal minds, have dared to deviate from the beaten track, and boldly point out the absurdity of antiquated errors, it is with no little difficulty, that men who have been long bigotted to forms can be induced to adopt more just and rational notions of practice.——It is however to be hoped, that the late improvements in this essential branch of Surgery, for which we are principally indebted to Mr. Pott, will soon become general, and that the most obstinate adherents to the old practice, will quit their error, the moment they are acquainted with a method, which is so demonstratively founded in the structure of the parts, the nature of the disease, and above all, in the incontestible evidence of the plainest facts.

The true curative indications in every simple fracture, are to reduce the broken extremities of the bones, as nearly as possible to their natural situation, and to retain them when there, by the most easy, simple and effectual means. How far the methods hitherto made use of, were calculated



calculated to answer these desirable purposes, will best appear from a fair and candid examination of them.

In the first place, an extension and counter-extension, as it is called, was made by two assistants, with more or less violence, according to the nature of the case, until the extremities of the broken bone were brought opposite to each other, when the Surgeon with his fingers finishes the coaptation or setting, after which a long roller, making many turns both upon, as well as above and below the fractured part, was applied; upon this roller, splints of different kinds, armed with tow or linen compresses, to fill up the inequalities, were placed longitudinally, and secured with tapes or some kind of ligature, drawn pretty close, to preserve the fractured bones from slipping out of their place, and for greater security, the limb was fixed in a straight direction fully extended, and resting upon the calf and heel, in a fracture box, defended by a pillow or some soft substances.

This is, I think, the general method of reducing simple fractures, formerly followed by the Surgeons of most countries; and which is pursued to this day, by a great majority of practitioners in Europe, as well as America; and many a painful, tedious hour, has it cost the unfortunate patient, as well as difficulty and solicitude to the Surgeon, to prevent all the mischiefs arising from this preposterous and irrational mode of reducing and treating simple



fractures, I shall only mention some of the most usual difficulties attending it,

In the first place, the violent extension frequently made use of by the assistants, often occasioned so much pain as to induce such a degree of inflammation and swelling, as obliged the Surgeon to loosen or remove his bandage; which could only be done by cutting it at the extremities with a scissars, or taking it entirely off;—this necessarily occasioned a removal and disturbance of the limb, which should always be avoided, as much as possible, in all fractures: But if these mischievous consequences did not follow the first reduction, others no less painful, though not so easily relieved, arose from the extended position of the limb—besides the stiffness of the knee, and shrinking of the calf of the leg; the most intolerable uneasiness is very soon created to the patient, from the constant and unavoidable pressure of the heel, upon whatever substance it rests—a long decumbiture will frequently produce a mortification of the integument; and I have more than once or twice seen the bone laid bare, by this absurd and painful posture.

To point out a more just, easy, and natural method of cure, shall be the remaining business of the present chapter.

To obtain any adequate ideas of the nature of diseases, it is absolutely necessary to have a competent knowledge of the structure and offices of the parts affected; it is from this source alone,  
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that we can lay any reasonable foundation for a just method of cure, even this necessary knowledge will be insufficient, unless we are capable of thinking, examining, and acting for ourselves. The general structure and uses of the bones and muscles have been well understood for many centuries ; yet nobody, until of late, has had sagacity enough to apply this general knowledge, to the particular purposes of the disease in question.

It is obvious however, to the most common understanding, that the bones, considered abstractedly in themselves, are mere passive inactive bodies, without any locomotive faculties, but are moved by powers firmly attached to them ; which powers are called by Anatomists the muscles, and these bodies have the singular property of contracting, or lengthening themselves, according as they are influenced by the mind, or the operation of external bodies stimulating them to action.

When a bone therefore is broken and separated, it has no power of restoring itself to its natural situation ; whatever change of place it receives, must be entirely owing to the action of the muscles, which alone possess this astonishing power of contraction, and which is increased or diminished more or less, according as they are placed, in a state of tension or relaxation.

Upon these self evident principles the absurdity of the old and general practice of reducing fractures, will appear in the most striking light ;—

light ;—every man who has had the least experience in Surgery, will easily recollect and acknowledge the appearances which generally exhibit themselves in fractures of the lower extremities, where the ends of the broken bone occasion more or less deformity, according to the nature of the fracture and the force of the surrounding muscles—in oblique fractures of the thigh, this effect is very remarkable, the ends of the bones lap over each other to a considerable distance, and produce a very apparent inequality in the appearance of the limb, often attended with much pain, from the sharp points or edges of the broken extremities.

The position which the patient always endeavours to place himself in, under these circumstances, will clearly point out the true state of his case, as well as the most rational mode of relief. Far from stretching out his injured limb, or lying on his back, the situation in which Surgeons place him for his relief, he naturally and instinctively seeks it by gently turning himself upon the injured side, drawing up the thigh towards the body, and bending the knee, by which means the muscles or moving powers, are immediately put into a state of the utmost relaxation, and their action upon the bones or ligaments entirely removed, which restores the patient to a state of ease and quiet.

What is the reason, says Mr. Pott, that a fracture of the os humeri is so easily reduced and maintained in its situation, with so little pain

pain and difficulty? It is because both the patient and operator, are obliged as it were, contrary to the mode of treatment in the lower limbs, to place the muscles of the arm in a state of relaxation, by bending the elbow, supporting it in a sling or scarf, and approaching it to the side of the body, where it rests in a state of ease and security.

Why is a fracture of the tibia, when the fibula remains unbroken, attended with so little pain or deformity, and retained in its place with so much facility? The reason is most obvious; the contraction of the muscles is prevented by the fibula, which keeps them in their natural state.

From what has been said, the true position of a fractured leg or thigh for reduction, appears to be the reverse of that hitherto made use of. Instead of extending the leg in a right line, and attempting to replace the broken bones while the muscles are in a state of tension and contraction; the patient is to be placed on his side, with his knee half bent, one assistant taking hold of the lower extremity of the leg, just above the ankle, while the other embraces the superior end just below the knee; both making at the same time such gentle extension, and no more, as is necessary to bring the bones opposite to each other; when the Surgeon, with his own hands reduces them to the most exact apposition in his power.

The relaxation of the muscles of the thigh,  
must

must be made by drawing it gently towards the body, and whoever examines with the least attention, the structure of this bone and its articulation with the hip, will readily discern how admirably this side position of the limb and body, is calculated to promote the patient's ease as well as happy union of the bone.

Extension and apposition of the fractured limb, having been made under the foregoing circumstances, the next consideration will be the application of proper medicaments to the part affected; a variety of compositions, consisting of adhæfive plasters, cerecloths, the white of an egg with vinegar, or thin compresses dipped in Spirit Vin Camphor, have been used for this purpose, many of them well enough adapted to answer the intention, while others, particularly the adhæfive plaster, by irritating and inflaming the skin, and exciting a tetters eruption, becomes exceedingly troublesome and injurious;—the only rational view in any external application, is to keep the skin lax, moist and perspirable, and by such means to repress or abate inflammation, disperse extravasation, while very gentle compression serves to restrain the bones in some measure to their proper places; and these desirable purposes are most effectually answered by a cerate with a solution of litharge in vinegar, to which such a proportion of soap, oil, and wax is added, as will give a consistence, that admits of being spread without warming.



But whatever be the form of the composition, it is of great consequence to have it applied in such a manner as will admit the fractured part to be viewed occasionally, without disturbing or removing the limb, and this is absolutely impracticable where the roller is employed; for which reason the eighteen tailed bandage which has been long used for compound fractures, is now with great propriety applied to simple ones, and the improvement made in the form of this bandage by Mr. Pott, renders it much more neat and commodious; for by giving the flaps or tails an oblique direction, they lap over each other with the utmost exactness, and lie perfectly smooth and even. You can also give them as much tightness as is ever necessary for any of the useful purposes of bandage in simple fractures; for the old notions of restraining a flux of humours, or preventing the luxuriant growth of callus have no foundation in reason, experience, or common sense;—the callus is a fluid, separated by nature from the extremities of the broken bones and periosteum, and its quantity is always in proportion to the nature of the fracture: If the bones can be brought into exact and even contact, a small quantity of callus is sufficient to unite them; but when they lap over each other, a larger portion becomes necessary to constitute a firm and solid union,—the deformity which is frequently the consequence of broken bones, is not owing to the exuberance of the uniting medium, but the ignorance or neglect

neglect of the Surgeon, who is ever ready to conceal his want of knowledge or attention, under the cloak of luxuriant callus.

I do not mean to insinuate that this is always the case. A Surgeon may be called to a patient where the time elapsed since the fracture, as well as other circumstances may render a perfect reduction utterly impracticable, in these cases we must satisfy ourselves with doing the best in our power.

The next part of the apparatus for a fractured limb are the splints, which are generally made of wood, or pasteboard, but so short that they can only act as a compress, and that a very hard and uneasy one, upon the ends of the fractured bones: But as the true use of splints is to preserve the whole limb in a steady, firm position, without compressing the fracture at all, they ought to extend below the ankle and above the knee; and with this rational view, the ingenious Mr. Sharp, one of the present Surgeons of St. Bartholomew's Hospital, has invented a set of splints both for the leg and thigh, which are admirably adapted to answer the foregoing intentions; those for the leg are only two in number, they are made of strong pasteboard, cover'd with thin leather, and fitted to the shape of the leg: The external or fibular splint, on which the leg is to rest on its side, has a hole at its inferior extremity, to receive the prominent ankle, and thereby prevent the pain and other ill consequences of hard pressure; the tibial

tibial one has only a cavity adapted to the shape of the internal malleolus ;---they are secured by three leather straps fixed to the outside of the fibular splint, which passing round the leg are fastened by small holes to little brass studs, stuck on the back of the tibial, or what, according to the posture in which the limb is placed in this method of treatment becomes the superior splint.

But as the best description I can give will fall short of reality, and these splints are not to be had here, I have endeavoured to supply their place by wooden ones of the same shape, which when lined with compresses of linen or flannel, extending beyond their edges, and adapted to the inequalities of the parts, answer the purposes of Mr. Sharp's, without the disadvantages to which pasteboard is subject ; whenever you apply either cataplasms or embrocations, which are often necessary on account of swelling and inflammation.

After the splints are applied, the leg is to be placed on a pillow with the knee half bent, the posture in which the reduction was made, and as the position of the body as well as limb is on its side, the patient may be removed from one part of the bed to another with great ease and safety, or even removed if necessary, to a distance from the place of accident, which are advantages not to be received in the old way, without difficulty or danger.

The principles and practice here recommended

ed for the treatment of simple fractures of the leg, are equally or more applicable to those of the thigh, where the superior strength of the surrounding muscles are more disposed to produce a displacement of the bones, when kept in a strait extended direction with the patient on his back. The splints for the thigh are three in number, of a strait hollow form, the external or longest one extending from the hip to the knee on the outside, is attached by a leather strap to one passing round the body; the other two splints are placed at proper distances on the anterior and inside of the limb, and the whole secured like those of the leg, by leather straps fastened to brass studs on the back of the short splints.

Before I quit this subject, it may not be improper to take notice of a cant phrase made use of by many Surgeons called the rising end of a bone. This expression, like many other abuses of words, only serves to veil our ignorance, for it either conveys no idea at all, or a false one, as will plainly appear from a just examination of the fact which gave rise to it. In every fracture of the limbs, surrounded by strong muscles, their contractile power forces the inferior extremity of the fractured bone under the superior one, which is incapable of motion, but immediately exhibits that appearance of inequality, which has occasioned the false idea of a rising bone, and has put both Surgeons and Patient to much useless trouble and pain in dressing.

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The only way to remedy the evil is, relaxing the muscles of the limb, and raising the depressed end of the bone to an equality with the other. This observation is equally applicable to the clavicle as to the hip and thigh.

But here it will be probably asked by some persons who have been long in practice, and acquired no inconsiderable degree of reputation, have not many good cures of simple fractures been performed by the old method, which in the preceding pages is so much exploded? I answer undoubtedly, yes. I have performed many myself, but it is equally true and certain, that many of them were obtained with prodigious trouble and difficulty to myself, as well as pain to the suffering patient, to say nothing of the deformities which too often arose in consequence of the old method of reducing fractures when practised by the ablest operators.

Fractures of the cubit or fore-arm, particularly of the radius, are reduced upon the same general principles already recommended. The disposition of the limb must favour the relaxation of the muscles, and this is a kind of middle state between pronation and supination. The palm of the hand should be applied to the breast, the thumb superior with the fingers moderately bent, the whole secured with a couple of splints, of which the internal one should be extended and fitted to receive the hand and fingers in the position already described. Mr. Gooch, in his surgery, has given the draught of a very neat and ingenious contrivance for this purpose.



There are two kinds of fractures however which do not admit of the bent posture of the joint, and these are the fractured patella, and process olecranon at the elbow, where a strait position of the limb becomes necessary for the same reason that a bent one is so in other fractures, viz. the relaxation of the muscles and tendons attached to the fractured bone.

Whenever the patella is fractured transversely, the superior fragment is drawn upwards by the strong action of the extensor muscles of the leg while the lower part remains fixed by its ligament. Extending the leg puts these muscles in a state of relaxation, and enables the Surgeon to approach the uppermost fragment pretty nearly to the lowest, where it is easily retained by a moderate compress and bandage, and as soon as the swelling and inflammation are subsided, the knee should be gently moved every day in order to prevent stiffness, and preserve the motion of the joint.

As the leg in this species of fracture is necessarily kept in an extended posture, it should be a little raised, and at the same time equally and exactly supported, its whole length, with pillows, to prevent too great pressure upon the heel, which would otherwise unavoidably happen.

If much swelling and tension should have come on before the Surgeon is called in, he ought to wait some days, until these symptoms are removed

moved by proper cataplasms, fomentations and evacuations, before he applies his bandage.

This practice has been recommended and not without reason, under the same circumstances of simple fractures of the leg and thigh, when treated in the old way ; but few cases will now occur, where the Surgeon will not be able to make the reduction immediately, or in a very short time, by placing the limb in a state of flexion and relaxation, and preserving it in that situation during the cure.

However, after all general directions, the patient's feelings will constitute one of the best rules with respect to the fitness of time for the reduction of fractures attended with swelling and inflammation, whenever it can be done with tolerable ease to the patient, it will certainly be proper.

## CHAPTER VI.

### ON COMPOUND FRACTURES.

**W**HEN the bones are not only broken, but their extremities are forced through the muscles and external integuments, the accident is called a compound fracture, in opposition to a simple one ; and these two general distinctions are all that are made use of by English Surgeons, and will comprize every essential difference in the nature of fractured bones.

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The first object of consideration in every compound fracture is, whether the nature of the accident is such as to admit of the preservation of the limb with probable safety to the patient's life, and this interesting question has given rise to very opposite opinions between several Surgeons of the most distinguished reputation, some of them, particularly Mr. Pott, advising immediate amputation in almost every bad compound fracture attended with comminution or splintering of the bones, while others contend as strenuously for its absolute inutility or at least impropriety, in nineteen cases out of twenty. As both sides appeal to experience in support of their assertions, it is no easy matter to reconcile such opposite extremes. Truth perhaps may lie somewhere between both, and to hit this happy golden mean, constitutes the perfection of human judgment. A candid and impartial examination of the different sentiments adopted by the opposite writers upon the present subject, will, in a great measure, account for the contrariety of their opinions which seem to have arisen more from the difference of situation and circumstances in their patients, than any real disparity in their ideas of the disease.

Mr. Pott, who is the principal advocate for amputation, has very probably formed his opinions upon the fatal consequences which generally attend compound fractures in Hospitals, while Mr. Bilguer, Mr. Kirkland, Mr. Gooch, and some other gentlemen who live in the country,

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have

have drawn their conclusions from the great success attending private practice; both parties may be right, and their difference of opinion very reconcileable to truth and experience.

If we reflect upon the state of air in the crowded wards of large Hospitals, in great cities, we shall easily account for the different success which attends operations performed in such situations, from that of private practice, particularly in the country.

In the first situation, the air is not only rendered less healthy to breath in, from great numbers of sick persons confined within a small compass, but the putrid effluvia arising from wounds and ulcers, renders it highly pernicious. Every man who has attended Hospital practice in London, must be sensible of the ill success which attends the operation of trepanning, even in common cases, and yet the same operation in the private practice of small towns, and the country, generally succeeds very well.

For the same reason, compound fractures of the limbs will be attended with much more danger in a large Hospital, than in private practice, and a Surgeon might with equal propriety attempt to save a limb in the latter situation, or amputate it in the former.

In general, all fractures about the joints where the capsular ligaments are torn, and the heads of the bones are injured, require amputation, and that should be performed as soon as possible, before any symptoms of inflammation are come

on;

on; the least delay in such cases often proves fatal; for having missed the first opportunity, a second is often denied us, and when it is not, the chances of recovery are much greater in the first instance.

When a limb is thought capable of preservation, the next consideration is the mode of reduction, and this must be determined by the particular nature and circumstances of the fracture. If the bones have been broken in near a transverse direction, and the protruded extremity, (which is always the upper bone,) can be nearly restored again to its proper place, the reduction and cure will be both very easy. But in case of an oblique fracture, a long sharp point of bone, is sometimes thrust out through a small wound, which compressing and as it were girding the bone, prevents its return; and the more you extend the limb, the stronger this compression becomes. In this situation many Surgeons advise an immediate removal of such a portion of the protruding bone, as will render the return of it easily practicable; however, before we proceed to this step, it will be advisable to attempt the reduction, by relaxing the muscles, and making a free dilatation, by which method there are few cases, I believe, which will not admit of relief.

The advantages of making large dilatations are very obvious; they facilitate the reduction of the fractured bones, without any loss in their length, give the Surgeon a fair opportunity of  
examining



examining and extracting any detached splinters, and what is of great consequence in the course of the cure, afford a free passage to the discharge of any extravasations or collections of matter; and as these dilatations are only through the integument, there is neither difficulty nor danger in making them.

In the treatment of fractures, attended with much comminution, or many splintered fragments, and great laceration of the surrounding muscles, the utmost skill and judgment is requisite. As many of the loose fragments as can be removed, without occasioning much pain, or risking a dangerous hæmorrhage, should immediately be taken away, but no more. For as pain, irritation, and inflammation, are the grand objects of apprehension, it is of little consequence to the patient, whether they are induced by the nature of the accident, or the Surgeon's rough and absurd treatment.

The necessary dilatations having been made, and all loose bones, or the irritating points of fixed ones removed, the next consideration is the reduction or setting; and here the same principles and rules recommended in the chapter upon simple fractures, are more than equally applicable; for if violent extension, and strait position were improper, where the bones were only broken, without any external wound, and very little injury to the internal parts, they must be infinitely more so, where the muscles and integuments are much lacerated.

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For these reasons, after the most gentle and careful extention and exact apposition of the bones, the surgeon is next to consider of the proper dressings, which are of two kinds; such as are requisite for the wound, and such as are applicable to the limb. The former are intended to promote a free easy discharge of any matter or extraneous bodies; the latter respects the prevention or removal of inflammation and its usual consequences, suppuration, gangrene and mortification.

Dry soft lint applied so lightly, and in such small quantities as not to obstruct the free discharge of matter from the wound, will very well answer the first intention, while the cerate recommended in the chapter upon simple fractures, with discutient embrocations and the spiritus mindereeri, acetum lytharg, or gouldards aq. saturn. joined to moderate bleeding and the general antiphlogistic regimen, perform the second, and a happy cure is frequently obtained by what surgeons call the first intention, or at least with very little inflammation or suppuration. But here it must be observed, that I suppose the muscles have not been much torn or wounded, and no considerable degree of tension, pain or swelling have arisen, for under such circumstances, the wound should be dressed directly with some mild digestive, and the whole limb enveloped with a soft relaxing cataplasim, which joined to fomentations, are the most effectual

fectual means of promoting a kind speedy suppuration, the next salutary intention of cure.

With respect to evacuations, particularly bleeding, which must be always used, but with discretion, for profuse or repeated bleeding, though it may take off inflammation sooner, yet must inevitably weaken the patient too much, and promote the future absorption of matter. What purges are used, sh<sup>ould</sup> be of the gentle cooling kind, with sudorific anodynes interposed to calm irritation and pain, and during the tense swollen state of the wound, no heating tinctures of myrrh and aloes or terebinthinate balsams should be applied to it, but in the latter end of the cure when the parts are become very lax and flabby, they may be used with some propriety. Scarifications, during the preceding state, even when a gangrene is threatened, are very improper, as they stimulate the parts without procuring any discharge, for which alone they can be intended by those who have any rational views of relief in the cure of diseases.

Compound fractures require dressing at least once a day, and in hot weather under large discharges oftener. For this reason, the eighteen tailed bandage becomes absolutely necessary to prevent a frequent removal of the limb, which is extremely injurious, and ought to be avoided as much as possible; indeed without perfect rest, and an easy posture, no applications will succeed.

succeed. The splints to be made use of here, are the same as directed in simple fractures.

As the large discharge of matter in bad compound fractures, renders a change of the bandage too often necessary and thereby disturbs the quiet of the limb, I generally apply a piece of fine oil cloth between Mr. Pott's bandage and the skin; this set smooth and easy on the part, and prevents the matter from soaking through to the bandage, which, by this means may be kept clean and sweet during the greatest part of the cure, particularly if we are careful to absorb the discharge with small bits of soft sponge at every dressing, and when the swelling and inflammation are subsided, to moisten the bandage with a little spt. vin. camphor, or plain spirit. During this stage of the disease, abscesses and lodgments of matter are frequently formed in various parts of the limb, either from the deep depending situation of the wound, or sharp splinters of the bone, irritating the nervous and muscular parts; and these accidents require the utmost skill and attention of the Surgeon.

If the mischief is occasioned by a splinter, it ought, if practicable, to be extracted, as it will continue to excite new inflammations, and those attended with violent pricking pains, which generally distinguish these collections of matter from those arising in consequence of unfavourable situation.

In the last case, counter-openings, in the most depending part, are the only effectual remedies,  
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and I have sometimes made them with great advantage on the inferior part of the leg, leaving the orifice without any other application to it than the oil cloth, rather than attempt to favour the discharge, by a more painful posture of the limb.

Young Surgeons from a principal of timidity are too apt to omit these openings, and attempt to press out the matter, and unite the sinus by sticking plasters, compress, and bandage; which besides their inefficacy, are very injurious during a state of tension and swelling. They have their uses as preventatives, to resist the distention of the vessels, or to brace them up, when too much relaxed and weakened, but should never be employed under the circumstances above-mentioned.

The relaxing cataplasms and fomentations, should be continued during the whole state of inflammation and swelling, but no longer; for they afterwards tend to increase the discharge, and weaken the patient, whose strength, at this time, requires to be supported by a more nourishing diet, and the use of the bark.

From what has been said, it appears, that a compound fracture is healed as it were by the hand of nature, with little or no suppuration; or it may be attended with high inflammation, repeated abscesses, and a great discharge, demanding the utmost skill and attention of the Surgeon, whose best efforts are sometimes baffled, and the patient is obliged to com-  
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pound for life with the loss of his limb, in consequence of the excessive drain and constant absorption of matter, which keeps up a continual fever, and daily waste of the patient's strength. Under these circumstances, there is no remedy left, but amputation, the propriety of which must be determined by the judgment of the attending surgeon, who ought always on these occasions, to call in the best advice and assistance he can procure, both on account of his own reputation and his patient's satisfaction. But here it may be right to observe, that amputation is rarely, if ever necessary, in consequence of the drain, where the bones are united, and wherever it is necessary, the fracture will be found in a loose unconnected state.

But it sometimes happens that all our endeavours to preserve both life and limb, prove fruitless; from the beginning, a gangrene and mortification coming on immediately in consequence of high inflammation, bad habit of body, or ignorance and inattention of the Surgeon. In the first case the disease may be regarded as merely local, being occasioned by such a degree of injury done to the parts, as to prevent the circulation through them, which must inevitably produce an early mortification, and render immediate amputation the most advisable remedy. Writers, however, are pretty much divided in their opinions upon this subject; nor is it an easy matter to define the precise degree of injury which renders immediate am-

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putation absolutely necessary; for after the best general directions (and they are the most that can be given) the particular nature of the accident and circumstances of the patient must determine the Surgeon's judgment. Mr. Pott is a warm advocate for early amputation, and thinks that even a very few hours make all the difference between probable safety, and certain destruction. But here again it is very possible the ill effects of Hospital air may have influenced his opinion; for it is certain that in private practice, a mortification in consequence of a local injury, is much less dangerous, than one produced by a gangrenous disposition of the fluids; and the symptoms attending the former, are by no means so frightful and alarming as those which accompany the latter; for these reasons I would advise the young practitioner to be governed in such difficult cases by the particular situation of his patient; if placed in a large or crowded Hospital, speedy amputation should take place, but in private practice, and in a pure and healthy air, every effort should be exerted to save the limb; the mortification too, under these circumstances rarely extends beyond the limits of the injury; the patient preserves his countenance serene, is attended with no more fever than is usual in violent contusions, there is little or no previous gangrene of the subcutaneous parts, or emphysema from confined putrid air; but the mortification takes possession of the skin and flesh at once, and if you make  
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make an incision through the skin, there is no feeling in it, and nothing but extravasated blood is discharged.

On the contrary, when a mortification takes place in consequence of a gangrenous disposition of the juices, whether the injury be more or less severe, the muscular and membranous parts are corroded by an acrid lymph, the membrana adiposa is filled with air bubbles, producing an extensive emphysematous tumor in the skin, which is not yet apparently diseased, though it plainly points out the tragedy which is acting underneath; at this period a fever often accompanied with a delirium, great dejection of spirits, and particular wildness in the looks comes on, the pulse is generally quick, low, fluttering, and unequal, according to the age and strength of the patient.

Incisions now made through the skin, give pain, and its vessels discharge a florid blood, which proves that the circulation is carried on, during the gangrenous state of the muscles and adipose membrane, which are of a yellowish brown colour, and soon change for the worse; the skin becomes greatly inflated, and when pierced, discharges from beneath, a quantity of frothy matter with air; at last the skin itself turns livid, and a general mortification closes the scene.

To oppose this frightful train of symptoms, and promote if possible, a separation of the sound from the mortified parts, will require all  
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the aid of the chirurgic art. Immediate recourse must be had to the bark, which ought to be given in substance, and in as large quantities as the patient's stomach can bear. Incisions should be made down to the *membrana adiposa*, in order to discharge the confined air and acrid matter, as well as to make room for the application of warm, spiritous fomentations, and proper digestive ointments, over which should be applied double compresses, wrung out of common spirits, and renewed two or three times a day. The diet should be cordial and nourishing, and the patient's spirits supported by every attention and encouragement in the Surgeon's power. By these means the progress of the mortification is sometimes happily restrained, and a separation of the sound, from the mortified parts taking place, admits of a composition for life, with the loss of the limb by amputation, the method of performing which operation will be described in the following Chapter.

## C H A P T E R VII.

### O N A M P U T A T I O N.

**A**S every operation is necessarily attended with a certain degree of bodily pain, as well as terrible apprehension to the patient's mind, a good Surgeon will be in the first place,

place, well assured of the necessity of an operation, before he proceeds to perform it; and secondly he ought to consider, whether the patient will in all probability be the better for it, or whether he may not be the worse.

It will also be of singular advantage to young surgeons particularly, before they begin an operation, to go through every part of it attentively in their own minds, to consider every possible accident which may happen, and to have the proper remedies at hand in case they should; and in all operations of delicacy and difficulty, to act with deliberation, and never affect great expedition, by which, very capital and even fatal errors have been committed. The maxim of "*festina lente*" is in no cases more applicable than in these; it is also of no small importance to support the patient's spirits with a cheerful assurance of success, and the appearance of such a degree of modest confidence as may serve to inspire him with it, and by all means to avoid terrifying him with the appearance of the apparatus, or a vain and ridiculous parade of any kind.

The surgeon should choose his own assistants, acquaint them with his intended mode of operating, and avoid a useless crowd of spectators.

With these prerequisites, joined to those qualifications already mentioned in the introductory discourse, as necessary to constitute a good operator; a Surgeon will undertake most operations with at least a strong probability of relieving his patient,



patient, which is performing one of the most essential offices of humanity.

When the amputation of a limb is determined on, the following apparatus should be prepared in a different room. A large dish, with a compress to be placed over the vessels made in the form of a roller, flattened and sewed to the middle of a slip of linen, between two and three inches wide, and of sufficient length, to pass two or three times round the limb. The tourniquet or leather with a fillet and stick, a yard of tape rolled up, the amputating knife, catlen, saw, tenaculum, crooked needles armed, and ligatures of waxed thread, loose, a pair of strait scissars, and sponges.

In another dish should be placed a sufficient quantity of lint, some long pledgets of the same, spread with simple cerate or soft digestive. A large pledget or two, of tow armed with the same cerate, and a few soft compresses of tow unarmed. Slips of linen about three inches wide, to cross the stump, and retain the pledgets, &c. two rollers of different lengths, and a loose, knit woollen cap, to draw over the whole.

If the leg is to be removed, the most convenient posture for the patient, is lying on a firm table of convenient height, covered with blankets sufficiently doubled, and pillows to support the head. The operator, standing on the inside of the leg, held in a steady horizontal line by the assistants, first fixes his compress longitudinally, over the course of the artery in the ham; then  
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bringing the two ends of the bandage to which it is fixed, towards each other, and passing one of them through a slit made in the opposite extremity, as in the uniting bandage, he makes two or three turns round the limb, with the longest end, and drawing it pretty tight, fastens it with a pin; over this is fixed the tourniquet, or leather, with the fillet and stick, \* which ever of them are used, and having given it the necessary degree of tightness, he delivers it into the hands of his assistant; then fixing upon that part where the first incision is to be made, which is about four fingers breadth below the patella, he passes the tape about half an inch below this part, and making a turn or two, pretty close, fastens it with a pin. He then beginning the first incision on the outside of the leg, as high as he can carry the knife without constraint, divides the skin, and membrana adiposa down to the muscles; and bringing his knife forwards, terminates his first stroke far enough on the inside, to make one half of the circumference of the circle, which  
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\* This is by many Surgeons, in private practice, preferred to the screw tourniquet, and consists of a piece of strong worked binding, an inch broad, and five quarters long, which surrounding the circular band, its extremities are passed through two slits, cut transversally one inch from each end of a piece of firm sole leather, about three inches long, and two and a half wide. The ends of the fillet are then tied in a strong slip knot, and a round stick, four or five inches long, and three quarters thick, being passed between the leather and fillet, the assistant, by turning the stick, makes what degree of compression he pleases, upon the artery.

is finished by another stroke carried from the place of beginning, to meet the opposite point. It is to be observed that this incision is to be made above the tape, which then falls below the wound, without embarrassing the operator.

The first incision being completed, so as even to mark the muscles, rather than suffer any adhesion of the adipose membrane, the assistants are to draw up the integuments as high as possible, when the muscles are to be divided by two semi-circular incisions, quite down to the bones.

The interosseous ligament must then be separated by the Catlen or point of the amputating knife, pushed between the bones, which are next to be carefully sawed through. \*

The assistants observing to hold the limb in the most exact horizontal line, least by raising the leg in the beginning or middle of the operation, the saw should be compressed by the extremities of the bones, or towards the latter end of it, by letting the limb fall from the direct line, the tibia should break off and form a sharp point or splinter.

When

\* Mr. Bromfield recommends a piece of soft leather about eighteen inches long, and of proportionable breadth, which being slit half way down the middle, is easily received between the divided flesh, and one flap being lapped over the other, the assistants take hold of the two ends, and drawing them up, not only keep the muscles out of the way of the saw, but by forcing them higher up, enable the operator to remove more of the bone, and by that means prevent a pointed stump.

When the leg is removed, the principal arteries are to be secured either with the common crooked needles and thread, or the \* tenaculum, it is seldom necessary to take up more than three or four vessels, the mouths of which from their size are in general readily enough distinguished without loosening the tourniquet, which however ought to be quite loose as soon as the principal vessels are tied, that the circulation may be carried on more speedily in the minute collateral branches of the stump, and discover such as need to be secured. In taking up an artery, the needle must be passed on each side of the vessel, but no deeper, nor more flesh, inclosed, than will serve to prevent the † ligature from falling off. This last part of the operation being finished, the tourniquet removed, and skin drawn down on the muscles, the dressings are next to be applied in the following manner. First, two round pledgets of lint upon the ex-

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tremities

\* The tenaculum is an instrument made in the shape of a large crooked needle with a round point fixed in a small wooden handle, serves to pierce the end of the artery, and draw it out sufficiently for the assistant to make a ligature upon it, by which method less pain is excited, and the ligature drops off much sooner than in the common way. This mode, however, though warmly recommended by Mr. Bromfield and Mr. White, is not generally adopted, and requires the sanction of further experience, to give it the entire preference over the usual method.

† The ligatures should be made of shoemakers thread, which compresses without cutting, and the size of the ligature must always be in proportion to the largeness of the vessel,

tremities of the bones, over which ‡ a piece of fine old linen exactly fitted to the muscular part of the stump is to be laid, then dossils of lint sprinkled with flour, are to fill up the cavities, made by the circular edge of the skin and membrana adiposa, upon which the armed pledgets of lint are to be applied, and over these, the large ones of tow; the long compresses or slips of linen are then to cross each other at right angles, and pass far enough on the sides of the stump, to be retained by the first roller, a few turns of which, but not tightly drawn, are sufficient for the purpose; the second roller is employed in making several spiral turns from above the joint, down to the edge of the stump, where it is fastened with a pin. Lastly, the woolen cap is drawn over the whole leg, stretching it from top to bottom, with both hands, and slipping it gently on. The patient is then to be laid in his bed, his thigh a little elevated, and the knee gently bent and supported by a soft pillow, a sudorific anodyne, to quiet pain, and dispose him to a gentle diaphoresis, should be immediately given, and perfect quiet enjoined, as an essential requisite to his recovery.

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‡ The circular piece of linen applied immediately to the muscular part of the stump, is preferred by Mr. Bromfield, to dry lint, as it comes off much sooner and easier than lint, which adheres a long time, and very closely to the surface of large wounds. The application of sponge is attended with the same or greater inconveniencies, from the granulations of flesh insinuating themselves into the porous substance of the sponge.



The mode of operation in amputating the thigh, differs but in few particulars from that of taking off the leg. The compress and tourniquet are to be fixed higher upon the course of the artery, and the Operator stands on the outside of the limb, the patient being seated in a chair as more commodious for both. Before the bone is sawed through, Mr. Bromfield advises the operator to separate the muscles which adhere closely to the *linea aspera*, with the catlen. This may be done about half an inch or something more in length, and will, by that means allow a larger portion of the bone to be removed without tearing the muscles, and consequently a better stump be made. The roller first applied, should be attached to a broad bandage surrounding the body, and descend by spiral turns around the thigh, until the edges of the last turn are exactly even with the edges of the stump. This mode of applying it, will prevent the lodgment of matter, which happens when the roller is carried beyond the edges of the wound, or that retortion of the lips occasioned by the rollers falling short of them. As the principal uses of bandage after an operation, are to restrain hæmorrhage, and retain the dressings, it should never be tighter than to answer these purposes, for any thing beyond these, will, by obstructing the freedom of the circulation, increase the swelling, pain and inflammation of the parts.

Surgeons are generally too solicitous about drawing down the skin, and retaining it by  
close

close bandage immediately after the operation, in order to make a good stump; but this is done to much better advantage, when the tension and swelling are carried off by digestion, and the parts have acquired their natural tone.

Should the Surgeon, however, be threatened with a pointed stump, notwithstanding the mode of operation and bandage already recommended, the following method of treatment will contribute greatly towards preventing this troublesome consequence of amputation.

Having spread a large piece of skin with the adhesive plaister, let a sufficient number of slips two inches wide, and long enough to surround the thigh, be cut from it. The first slip is to be applied close to the edge of the skin on the stump; the next, about a quarter of an inch lapped over the first, and so continued till the last slip is applied near the top of the thigh; over these a roller sprinkled with powdered rosin, is to be passed from above, downwards, in the manner already mentioned, and then wetted with spirit of wine, which soon grows dry, the assistants are then to draw down the skin and muscles over the end of the bone, and the Surgeon having applied his dressings, secures them on, by a number of the slips of sticking plaister, which are to cross each other, and pass high enough on the sides of the stump, to retain the integuments and flesh in their desired situation. These slips and roller form a case which scarcely  
requires

requires to be renewed during the greatest part of the cure.

As a preservation of the joint of the knee to be used with the remaining part of the leg after amputation, is attended with great advantage to the patient, several ingenious Surgeons have lately revived a method long since recommended, but never practiced with success, until within a very few years. Instead of taking off the leg at the usual place below the knee, the first incision is made about four inches above the ankle joint, and the remaining part of the operation finished in the common way; the tendons, which are here necessarily divided, are apt to protrude beyond the flesh after the operation, but may, without any pain, be taken off with the knife or scissars, to a level with the rest of the stump. One or two gentlemen of the profession, particularly Mr. O'Halloran and Mr. White, advise a flap to be formed of the posterior part of the flesh and integument, which, as soon as the digestion comes on, and the ligatures can be removed, is to be turned over the end of the stump, and retained there, either by future or compress and bandage, until the parts unite by the first \* intention; but as Mr. Bromfield, and Mr. Wright very ingenious Surgeons of Sheffield, have both performed the operation

\* The advantage proposed by this flap, is to form a cushion for the bone of the stump to rest upon, without danger of uneasiness or protrusion.

operation with the most desirable success, without the flap, it is certainly the most easy and simple mode of doing it.

It is to be observed that when the operation is to be performed in this way, the patient must have an artificial foot and leg, the hollow of which last should be formed so as to support the person's weight on its side, as much as on the extremity of the stump, which is thereby greatly relieved.

The superior advantages attending this mode of amputating the leg, both in point of beauty as well as utility, will, I imagine recommend it to general practice, as soon as its merits are sufficiently known. It is an established maxim in Surgery to take off the fore-arm as near the wrist as possible, and no objections are made to the performance of it there, notwithstanding its tendinous and ligamentous structure.

When the fingers and toes become carious, they are best taken off at the joint; and in order to save as much skin as possible, the circular incision should be made on the extremity of the bone which is to be removed, but not so low as to embarrass the operator in coming at the articulation; the capsular ligament of which will be readily discovered, by bending the finger towards the palm of the hand after the incision is made through the skin and tendons.

Mr. Bromfield advises a removal of the cartilaginous extremity of the bone with the knife, in order to promote a speedier growth of the granulations,

granulations, which however, I have generally found cover'd before the cicatrization took place. If the fingers are to be taken off at the first joint next to the metacarpal bones, it is necessary to divide the skin and flesh between them, quite up to the joint, before you make the circular incision.

Dry lint with moderate compress and bandage, are generally sufficient to restrain the bleeding; yet if an artery should be troublesome, it will be best to secure it with a ligature.

We are frequently in this country obliged to remove large portions of the metatarsal bones in consequence of mortifications from frost; and here it is to be observed, that as much as possible of the bone as well as skin is to be saved, in order to afford the patient a better support; though instances are not wanting of men's walking tolerably well upon the astragalus and os calcis alone. After dividing the fleshy and tendinous parts between the bones with the knife, and drawing up the skin as much as possible, before the circular incision is made, the bones are to be sawed through with a small spring saw; a bit of thin sheet lead being placed between the bones, to defend the tendons and flesh of the opposite side from being injured by the saw.

When anodyne, or antiphlogistic medicines become necessary, after any of the preceding operations, they are to be exhibited according  
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to the nature and urgency of the symptoms, which are seldom exactly alike in any two cases; for this reason the young Surgeon will easily perceive the necessity of acquiring some general principles in his profession, the application of which to particular cases must ever be left to his own judgment.

The principle of a relaxed and non-resistant state of the muscles, as arising from the bended position of the limb so frequently recommended in the Chapters upon simple and compound fractures, is equally applicable to the reduction of dislocations, which have hitherto been as little understood, if not less than those of fractures; but unless the Surgeon is very competently acquainted, not only with the structure of the bones, but their connecting ligaments in a recent state, together with the force, direction, and attachments of the different muscles and tendons, he can derive little more than a negative kind of instruction, from the writings of the ablest men upon the subject of dislocations. All I shall venture to recommend to the young Surgeon unacquainted with anatomy, is cautiously to avoid those mischiefs which always arise from a violent exertion of ill directed force. Whatever extension is made, should be done very gradually, by which means the muscles and ligaments will not receive half the injury from a great degree of distention, which they would sustain from even a moderate one very hastily exerted:—The hold which the  
assistants

assistants take, should always be applied to the dislocated bone; for instance, if the os humeri is dislocated, the lower extremity of that bone; and not the fore-arm, is to be held by the person who assists in the reduction:—The position of the limb below the luxated joint should be such as to give the least degree of resistance to the muscles above it; for this reason, in the reduction of a luxation of the os humeri, the fore-arm should be bent;—whenever a sufficient degree of extension is judged to be made, the Surgeon ought to make use of the dislocated bone as a lever to direct the head of it into the socket.—Indeed when the head of a luxated bone is brought by proper extension to a level with the edge of its socket, little or no external force is required, to replace it;—the surrounding muscles of the joint perform that part of the operation, better than the Surgeon himself.

## CHAPTER VIII.

### OF BLOWS ON THE HEAD.

**T**O give the young unexperienced Surgeon some general and clear ideas of the nature and treatment of this difficult and dangerous branch of chirurgical diseases, I shall consider the subject under three separate heads; The first, comprehending the injuries to which the scalp and investing membranes of the skull

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are liable. The second will treat of the symptoms arising from a commotion or concussion of the brain; and the third, shall comprize those complaints which are occasioned by a fracture of the bones of the skull, and its effects on the parts beneath.

If the structure of the scalp was not different from that of the common integument of the body, and wounds inflicted on it, were attended with no other consequences, than those of the common parts, a particular investigation of its injuries, might be deemed a useless labour; but when we consider that this covering of the head, consists, not only of the skin and adipose membrane, but the expanded tendons of the frontal, occipital and temporal muscles, besides the pericranium; that it has a constant communication, by means of the blood vessels, between the parts within and without the skull; the necessity of a particular attention will pretty evidently appear.

Although common incised wounds of the scalp which penetrate no deeper than the cellular membrane, are not generally attended with any particular circumstances; yet in certain constitutions of a peculiar habit and disposition, they sometimes produce very troublesome, and even alarming symptoms. Persons of a nervous and irritable system, are subject to violent spasmodic affections, accompanied with a low quick pulse, frequent faintings, want of sleep, and slight delirium; and I have known intemperate persons

persons of this irritable class, who have suffered even a jaw-lock, in consequence of the removal of a small incysted tumor from the head, where nothing more than the cellular membrane was divided.

Sudorific anodynes, joined with some of the foetid antispasmodics, generally remove those complaints in a few days, though to the young and unexperienced practitioner, they will appear very dangerous and alarming. Such as are of a bilious habit of body, are attended with a slight fever, a general tumefaction of the scalp, extending to the eye-lids and ears; the swelling is of the œdematous kind, of a yellowish hue, and is frequently beset with small blisters, filled with a serum of the same colour. In short, the inflammation in this case appears evidently to be of the erysipelatous class, though it is seldom attended with danger, and generally relieved by moderate bleeding, a few lenient purgatives, and febrifuge medicines of the neutral kind; the wound requiring no other than the usual dressings, with a warm discutient fomentation, where the inflammation is so high, as to render the disease very painful; in which circumstances, the sudorific anodynes may be given with advantage.

Punctured wounds of the scalp are generally more troublesome than those made with a cutting instrument, probably owing to a confinement of the discharged fluids, for which reason some dilatation will now and then be necessary; otherwise

otherwise they require no other method of treatment, than what has been recommended for incised wounds.

When a large portion of the scalp has been separated and detached from the pericranium, either by a lacerated or incised wound; the parts so separated, after being cleaned from dirt and coagulated blood, ought to be brought as nearly as possible into contact; and then secured by the interrupted suture, with proper compress and bandage.---In case the lips of the wound are so ragged and uneven as not to admit of an exact apposition, they may be brought to approach so near each other with a ligature and slip knot, as to lessen the deformity, and shorten the cure,---advantages which a good Surgeon should ever have in view.---Should the parts not universally unite, but form little abscesses in different places; these may easily be opened with the point of a lancet, and the matter be discharged: and this mode of practice, may take place with propriety, where the pericranium itself is removed, and a slight exfoliation succeeds, without retarding or obstructing the cure; even where the pericranium and aponeurotic expansion are become sloughy and inflamed. If the Surgeon is not in too great haste to cut, and will have patience to wait until a separation and good digestion are come on, he will frequently succeed in preserving the scalp, and avoiding that deformity, which a large scar and the loss of hair, must inevitably produce;---here, however,



ever, it must carefully be remembered, that the scalp is not absolutely spoiled by contusion, and that the injury extends no deeper than the external coverings of the cranium; when it does a very different mode of treatment will be requisite:—For if besides the symptoms already enumerated, as attending incised and lacerated wounds of the scalp, and which generally come on within three or four days after the accident; the patient should be seized, some time after this period, with a smart fever, severe pain in the head, great anxiety and restlessness, frequent shiverings, a nausea, delirium and convulsions, the wound at the same time putting on a spongy, glassy, unhealthy aspect, with the pericranium loosened, and detached from the skull; there will be great reason to suspect that the parts within the skull are affected, either by some extravasated fluid, pressing upon the brain, or from an inflammation and suppuration of the dura and pia mater: And as none of these symptoms appear at first, or immediately after the accident, so they come on in a kind of successive order; the first set, arising from an extravasation of blood or lymph, pressing upon the brain and origin of the nerves, so as to impair or abolish voluntary motion, and the senses, shew themselves earlier; whereas the other, being caused by an inflamed and putrid state of the membranes of the brain, seldom affects the organs of sense, until late in the disease, when such a quantity of matter is generated, as to  
occasion

occasion the same symptoms of pressure, with any other fluid.

Both these causes, with their effects, may happen to be combined in the same patient, and render the case a little more perplexed, and difficult; yet there are generally some characteristic marks, which serve at least to distinguish the inflammatory effects of contusion, from those occasioned by commotion and extravasation.

In such cases, that is, where an inflammation of the meninges or membranes of the brain is the consequence of contusion, and where little or no mark of external injury appears, the mischief is seldom discovered until several days, often seven or eight, after the accident;—a pain in the spot which received the blow, is generally the first symptom.—This pain is soon extended over all the head, and is attended with a languor and dejection of spirits, followed by a vertigo, inclination to vomit, restlessness and fever.—A day or two after this, if no evacuations have been used, a puffy tumor of the scalp, not rising very high, or exciting much pain, generally appears.—If this tumor is laid open, the pericranium will be found of a darkish hue, and either detached or easily separable from the skull; between which, and the membrane, a small quantity of a brownish ichor is generally lodged; the cranium itself being altered in its colour.—From this period, the symptoms are all hastily exasperated; the headache and thirst become more intense, the strength decreases,

decreases, the rigors are more frequent, and at last convulsive motions, attended either with delirium, paralysis or comatose stupidity, close the scene.

If, under these circumstances, the bone be perforated, matter will be found between it and the dura mater; and that, more or less in quantity, according to the violence of the injury, and the length of time since it was received.—Sometimes, the matter lies between the dura, and pia mater, and even upon the surface of the brain.

If the scalp was wounded at the time of the accident, or any portion of it removed to examine the state of the skull, the wound will look perfectly well for some time; but after a few days it begins to lose its florid complexion, turns pale and glassy, discharges a thin discoloured ichor, the lint sticks close to all parts of the sore, and the pericranium, instead of adhering firmly to the bone, easily separates all round, to some distance from its edges: the bone itself changing from its natural whiteness, to a kind of purulent hue, or yellowish cast.—All these changes in the appearance of the wound, indicate the diseased state of the parts beneath the cranium; which can only be relieved by perforating the bone, and this operation should never be delayed when the symptoms of an oppressed brain, or inflamed dura mater, are not speedily removed by proper evacuations, which have frequently prevented the dangerous consequences of violent blows on the head.

## CHAPTER IX.

## Of INJURIES arising from CONCUSSION or COMMOTION.

**A**LTHOUGH the terms of commotion, or concussion of the brain, have been used by many writers in so loose and vague a manner, as to convey very inadequate ideas of the nature of the disease; yet it is very certain, that the medullary part of the brain, receives such a degree of injury or derangement from violent shocks, as sensibly to impair its ordinary functions; and this injury is produced, without any fracture or fissure of the bone, or even the head receiving any particular blow upon it; as frequently happens in falls from considerable heights, where the shoulders, breech, and sometimes the feet, first strike the ground; and that such shocks are capable of producing, not only a disorder in the substance of the brain, but an inflammation, and suppuration of its membranes, is evident from the history of some well attested facts.\*  
 ——The symptoms, however, which attend injuries arising from mere concussion, and those occasioned

\* The late Mr. Hewson used to mention in his lectures, the history of a lady who was seized with all the symptoms of an oppressed brain some days after receiving a violent jolt in a post-chaise, but which was not suspected as the cause of her complaints until after her death, when, on opening the head he discovered an inflammation of the dura-mater, with large suppuration.

occasioned by extravasation, or inflammation of the dura mater, admit of a pretty clear distinction.—In the first case, or that of commotion simply, there is generally an immediate suspension of the common functions of the brain, to a certain degree :---The patient has a vertigo or giddiness, an inclination to vomit, upon swallowing any liquid; has a wildness in his looks, talks incoherently, is restless and sleepless, with little or no fever, or any of the other symptoms, already described as usually attending an extravasation or inflammation.

Gentle evacuations by bleeding, lenient purgatives and sudorific anodynes, frequently remove most of the complaints occasioned by concussion, in twenty-four hours, or two or three days at farthest: but if after this period, and the patient having been considerably relieved, the symptoms should be again renewed, and neither accidental cold, or irregularity in diet have been productive of their return; the Surgeon ought, immediately to be upon his guard, as further mischief than a mere shock or derangement of the brain is to be suspected.----- Under these circumstances, the evacuations already mentioned, and particularly bleeding, are to be repeated with more freedom,---the head is to be shaved and carefully examined, in order to see, whether no marks of contusion point out the seat of the complaint; for if they do not, we must trust to evacuations and the general antiphlogistic regimen, for the relief of the patient,



as the trephine cannot be applied with any tolerable propriety, unless we are guided by some external appearances, to the seat of the injury.----- Mr. Bromfield has lately recommended a liberal use of sudorific anodynes, without bleeding, not only under the preceding circumstances of concussion, but in fractures of the cranium, without applying the trephine:--- However, as he adduces no more than three or four cases, and those not very precise, in support of a practice so opposite to that of the most eminent modern Surgeons, I would advise the young practitioner, to be very cautious how far he adopts the opinions, even of so respectable a name as that of Mr. Bromfield, upon a subject which requires the united judgments of the ablest men of the profession, to ascertain with precision.

As anodyne medicines are the most effectual preventatives of inflammation after severe operations in general, and perhaps act as attenuants besides; I think they may, with great propriety, be employed in fractures of the skull, as well as concussions of the brain; but as evacuations in general, and bleeding in particular, are universally allowed to promote the power of absorption, as well as lessen inflammation, I think they should never be omitted in complaints arising from concussion of the brain, extravasation of any kind of fluid, or inflammation of the dura mater; those injuries, in particular, which arise from the pressure of a lymphatic extravasation, occasioned by a rupture of the finest vessels of the  
brain,

brain, can alone be relieved by absorption, as there are no symptoms, in such cases, which clearly indicate the precise seat of the collection; and, if there were, it would not be in our power to relieve them, by an operation.

I shall conclude this chapter, upon concussions of the brain, with the history of a case, which fell under my care many years ago, and which may serve to shew the perplexing obscurity sometimes attending certain cases of this nature, both with respect to the causes and cure of the disease.

A woman, about twenty years of age, in running hastily out of a cellar, struck the crown of her head with great violence against a beam. ---She was stunned with the blow, but after a few minutes, was able to go about her business, and continued apparently well for three or four days, when she complained of a giddiness and pain in her head, attended with a slight fever. Under these circumstances, I was applied to for assistance, and, after enquiring into the history of her case, and examining her head, where no appearance of contusion was observable, I took sixteen ounces of blood from her arm, gave her a gentle purge, and ordered a low diluting diet, which soon removed all her complaints, and she continued perfectly easy for ten or twelve days, when her former symptoms again returned, and were as speedily relieved by the same remedies.—In short, she continued to suffer periodical attacks of pain in her head with a fever, every twelve or fourteen days for near  
three

three months, and was as often relieved by gentle evacuations, until the eightieth day from the accident, when she suddenly became perfectly frantic and delirious, with a hard quick pulse, and most of the symptoms usually attendant on an inflammation of the dura mater.---A copious bleeding, and several glysters afforded very little relief, and as her situation was then to the last degree threatening, I was induced to examine the scalp with great attention, and thought I was sensible of some small degree of thickening on the part, where she first struck her head, and which she always pointed out, while sensible, as particularly painful: Upon this I made two semi-circular incisions, and removed a sufficient portion of the scalp, with the pericranium, which adhered pretty firmly;---then perforating the bone, and taking out the circular piece, I was surprized to find only a slight degree of inflammation upon the dura mater, which I immediately divided with the point of a lancet, but without any discharge of blood or matter;---all her dangerous symptoms disappeared the next day, returned no more, and she was cured in the usual time, without any other remarkable circumstance.

## C H A P T E R X.

Of INJURIES arising from a FRACTURE  
of the S K U L L.

**W**HOEVER has read with attention the two preceding chapters upon blows of the head and concussions of the brain,

will readily perceive, that a simple undepressed fracture of the skull, considered merely as a solution of continuity of the bones, can never occasion those dangerous symptoms, which often arise in consequence of such blows and concussions.—It is the injury, which the brain and its investing membranes sustain from extravasation and inflammation, which constitute the whole danger of such accidents, as is evident in many undepressed fractures of the skull, where no bad symptoms at all appear, and where the application of the trephine is sometimes unnecessary.---Whereas the most dangerous and fatal cases are generally those, in which there is not the least fracture or fissure to be found.

For these reasons the operation of trepanning in undepressed fractures of the cranium, may be performed with three different intentions; either to relieve the complaints arising from the pressure of an extravasated fluid.---To give a discharge to matter formed in consequence of an inflammation of the dura mater,---or it may be used as a preventative of future mischief. In the first case, the relief from perforation, is not only sometimes immediate, but frequently is not attainable by any other means.—In the second, it is the only chance for life; as there is no natural outlet for the discharge of matter formed in consequence of inflammation.---In the third, or preventative intention, it is a matter of choice, more than immediate necessity.

Few

Few persons, I believe, will hesitate to perform the operation under the two first circumstances, of extravasation and inflammation;---with respect to the third or preventative means, some doubts may arise with the young practitioner, about the propriety of performing the operation, while no bad symptoms appear, particularly as some writers advise us to wait until its necessity is indicated by such complaints as may both require and vindicate it.

To ascertain as nearly as possible the true line of conduct in so interesting a matter, it will not be amiss to compare the dangers resulting from the operation considered in itself, with those consequences which we may reasonably expect from an omission of the performance of it.

As to the operation itself, and particularly that part of it, which consists in perforating the bone, there is neither pain, difficulty, nor danger in it:---the loss of substance in the bone does not long retard the cure, and as to the admission of air upon the dura mater, it will in a great measure produce its effects through the fracture, where the perforation is not made.

The danger of omitting the operation, arises in consequence of the pressure upon the brain, and the inflammation of its membranes, so often repeated in the preceding pages; and as the most dangerous symptoms occasioned by these causes, do not come on immediately, frequently not until many days after the injury,  
it



it is impossible for the Surgeon to ascertain the mischiefs which may be occasioned by it; and when those mischiefs are indicated by the symptoms, the operation is the principal remedy we have in our power, and that is too frequently, under such circumstances, unsuccessful.

In short, if we compare the numbers of persons who die from collections of matter formed within the cranium, where the perforation has been neglected, with those who survive, under an early application of the trephine, the proportional success of the latter will be found so much greater, as to render the operation adviseable, in almost every case of a simple undepressed fracture of the cranium.

When a fracture of the skull is attended with a depression of the bone, the necessity of elevating the depressed part, in order to take off the pressure upon the brain is universally acknowledged; and when the injury, which the brain receives, is no more than what arises from that compression, the mere elevation of the bone, will procure effectual relief:——But as pressure, from this cause, may be, and most frequently is, combined with that arising from extravasation, the Surgeon is by no means to confide in the favourable appearances, with which we are often flattered after raising a depressed bone, but should pursue such methods as are most likely to prevent the more remote consequences of injury done to the brain and its membranes; and  
these

these means have been already pointed out sufficiently, in the two preceding Chapters.

A single perforation may suffice in small fractures with little depression, but when the force producing them was great, the depression considerable, and the fracture extensive, winding into a circular form, with the depressed part cracked and splintered; the best and safest way is to remove the whole, or at least the greater portion of the bone so depressed and injured; for whatever ill consequences may arise from denuding so large a space of the dura mater, much greater mischief is to be apprehended, from the confinement of that matter, which may of course be generated throughout the whole extent of the fracture and depression.

As rules laid down by the ablest writers, upon such a subject, can only be general, the peculiar circumstances of each individual, must furnish directions to the Surgeon, for his particular conduct. All depressed parts must be elevated; loose, splintered, and irritating ones removed; and at all events, a free discharge afforded to whatever extravasated fluids may be formed, sooner or later, in consequence of the injury:--- The earliest and most careful attention should be paid to every symptom and appearance, in order to obviate them in due season, for the proper opportunity once lost, is seldom to be regained by any future management.

There are certain parts of the cranium, where, on account of their structure, the application

cation of the trephine has been usually forbidden, by most writers---these are the futures, the inferior part of the occipital bone, that part of the frontal where the sinus is situated, and the temporal bones: The strong adhesion of the dura mater, and the course of the sinuses under the futures, have been deemed sufficient objections to the operation on those parts; but experience has taught us, that the dura mater may be separated without laceration; and that in case the sinuses are wounded, the hæmorrhage does not prove dangerous:---The occipital bone is rarely fractured without immediate death being the consequence, yet the superior part of it has been fractured, and the trephine applied, with success:---In case of a fracture in the frontal sinus, particularly from a musket ball shattering the posterior part of the sinus, Monsieur Le Dran advises the application of the trephine, to relieve the injury of the dura mater:---As to the temporal bones, they may be perforated any where above the ears, as the hæmorrhage from the artery is easily restrained by ligature where pressure does not succeed; and that convulsion, vulgarly called the jaw-lock as frequently attends wounds made in other parts of the body, as those of the temporal muscles; the aponeurotic expansion of which, covers a large portion of the parietal bones, where the trephine is daily applied without any apprehension.—— In short, the danger incurred from an application of the trephine to any of the afore-menti-

oned parts, is by no means equal to the mischief arising from its neglect; for though many of these operations do not succeed, the failure is to be attributed much more to the nature of the injury, than the violence occasioned by the application of the instrument.

When the operation is determined on, it is generally performed in the following manner:---The patient being conveniently seated on a low chair, or lying on a bed, with his head firmly fixed and supported by the assistants, the operator, with a strong scalpel, is to divide the scalp with the pericranium, quite down to the bone; and having discovered the fracture, is to trace it to its utmost extent, in order to fix upon the most advantageous spot, for making the perforation;---These being done, such a portion of the scalp and pericranium is to be removed, as will admit of sufficient room for the application of the trephine.-----If any vessels should be divided, the bleeding of which cannot easily be restrained with dry lint and moderate pressure, they must be taken up with the needle and ligature:---the crown of the trephine being then applied so as to embrace an equal portion of the bone on each side of the fracture; if it be small and undepressed, the operator works his saw, until he has made a furrow in the bone sufficiently deep to prevent it from slipping; then removing the pin, he continues the operation pretty briskly, taking up the crown every now and then to clear the teeth with a small brush, and wipe the dust with

with a pointed probe and lint from the circular furrow, as well as to examine whether the saw works equally, or the bone begins to be loose, (for the appearance of the diploe is not to be depended on, as a guide to ascertain the thickness of the skull, as in very thin ones, there is often none at all; and in old persons, it is generally obliterated; for which reason, if a Surgeon was implicitly to rely on the appearance of the diploe as a criterion of the skull's thickness, he might fatally plunge the crown of the trephine into the patient's brain; an accident, which has happened to some incautious operators.) When the bone is so nearly divided in the circumference of the circle as only to adhere, in one small part, it may easily be taken out with the forceps; and if any little sharp points should remain at the broken part, they must be removed with the lenticular.

Should any extravasated blood now appear between the dura mater and the cranium, and the patient in a few hours be relieved of his complaints, there will be no necessity for puncturing the dura mater: But if on the other hand, the symptoms of an oppressed brain should continue after the bone is perforated, and no extravasation appears on the dura mater, it ought to be divided with the point of a lancet, in order to discharge whatever collection may be formed beneath.——The part where the perforation of the bone was made, must be lightly filled with dry lint, and the whole wound dressed in the usual



usual way, with no other bandage than a handkerchief, folded in a triangular form and passed round the head, so as simply to retain the dressing.

In fractures with depression, the crown of the trephine must be applied on the sound part of the bone, but so near the fracture, that one side of the crown may make part of the circumference of the circle, and by that means form the most convenient introduction to the elevator. With respect to the number of perforations, they must depend entirely on the nature of the injury, and consequently the Surgeon's judgment can alone direct his particular conduct. Whoever has acquired JUST and GENERAL IDEAS of the nature of a disease, will seldom be at a loss how to apply THEM on particular occasions; and to him, who wants those ideas, no rules or directions will be of much consequence.

In the course of the cure, a troublesome fungus sometimes rises up from the dura mater through the perforations, or from those spaces where large portions of the bone has been removed. A variety of remedies have been recommended to repress this fungus, which, if not kept down in the beginning, grows amazingly fast, and resists every attempt to check it. The most useful application I have ever tried, is the prepared sponge, cut into slices, and laid immediately on the fungus, or with very thin pledgets of lint between the sponge and fungus, which last is very apt to insinuate itself into the porous substance of the sponge,  
and

and render its removal troublesome and difficult; a moderate pressure may be made on the dressings, by drawing the handkerchief something tighter than usual. In these cases, the discharge is generally very considerable, for which reason, as well as to prevent the adhesion of the sponge, the dressings ought to be renewed twice a-day, and the patient kept to a strict regimen, with a free use of the bark. Indeed there are no cases in surgery which require an exact diet and pure air in order to obtain a cure, more than those of fractures of the cranium.

As the following case was attended with some singular circumstances, I shall close this subject with a short account of it.

A boy, about fourteen years of age, by a fall from a window, fractured the left parietal bone, and was trepanned two days after the accident: The trephine was applied twice, and some extravasated blood discharged from between the dura mater and skull; no unusual symptoms appeared for several days after the operation, when a fungus suddenly sprouted up through the perforations, which no applications could restrain;—the trephine was applied a third time between the two first apertures, in order to relieve the stricture formed by the edges of the bone, and to view the state of the dura mater at the base of the fungus, where we found an opening, from which some matter was discharged from the brain:---The same dressings were continued, with moderate compression, but

but without any effect; for the fungus in a few days increased to the size of a large orange, and as the weather was hot, became so extremely offensive and troublesome, we had no other way to get rid of it, but by making a ligature around the base; and in two or three days it dropped off.—A new one however soon arose, and in a short time soon exceeded the first in size, discharging vast quantities of a foetid matter.—— The boy was now feverish, and often attended with a slight delirium, wasting fast in his flesh and strength, but preserving his senses perfectly well in general:---we were now reduced to the necessity of removing the fungus by another ligature, which soon produced the same effect, but in three days after it dropped off, the patient died.—Upon opening the head, which was done by Doctor Middleton and myself, we found the left lobe of the cerebrum entirely destroyed, and more than half of the right lobe converted into pus; yet the patient retained his understanding and senses, very accurately to the last hour of his life.

## C H A P T E R      XI.

### O F   G U N-S H O T   W O U N D S.

**T**HE first intention, with regard to wounds made by a musket or pistol ball, is, if possible, to extract the ball, or any other extraneous bodies lodged in the wounded part.—The next object of attention, is the hæmorrhage,

hage, which must be restrained, if practicable, by tying up the vessel with a proper ligature; as no styptic is to be relied on, exclusive of the mischief they otherwise occasion.

In order to extract the ball, or foreign body, Mr. Ranby, and Mons. Le Dran, whose judgment and experience in these cases are certainly superior to most men's, advise as little search, with the probe or forceps as possible, as all irritation on these occasions increases the consequent pain and inflammation.—Mr. Ranby is of opinion we ought not to attempt the extraction of any thing which lies beyond the reach of the finger, though if the ball can be felt under the skin, in an opposite direction to the wound, it ought immediately to be cut upon and taken out.—As the external wound made by a musket ball is very narrow, the orifice should be considerably dilated, and that on both sides, when it has penetrated through any part of the body or limbs, particularly the most depending orifice:---Yet in wounds near the joint, or in very membranous or tendinous parts, the knife as well as forceps should be put under some restraint, and no more dilatation made, than what is absolutely necessary for the free discharge of the matter lodged within;---for we know from experience, that wounds about the joints, are always attended with great pain and inflammation, are always disposed to shoot out fungous flesh, and form new abscesses round all the adjacent parts;---The air too, seems

seems to produce worse effects upon membranous and nervous parts, than those which are more fleshy; for all which reasons the young Surgeon should be very cautious in wounding them.----- The first dressings to a gun-shot wound, should be light, easy, and superficial, with a barely retentive bandage, which ought to be made of soft flannel rather than linen; ---if the lint be dipped in oil, it will not only fit much easier on the wound, but allow a freer discharge to the extravasated fluids, which nature always endeavours to expel as early as possible.---At the second dressing, some mild digestive may be used, and where the wound is large, the bread and milk poultice, or one composed of the farina lini, over all; and if much tension and inflammation attend, an emollient fomentation will be very necessary. —Though these symptoms will be much lessened, if when we are first called in, a proper quantity of blood is taken from the patient, his body kept open by clysters and gentle purgatives, an easy perspiration promoted, and in general a cool moderate regimen prescribed, avoiding every thing hot or spirituous, either internally or externally, which during the state of inflammation is extremely injurious to wounds:---Nor should the Surgeon, if not called in until the inflammation is come on, attempt to remove any extraneous bodies before it is almost entirely abated, and a good digestion appears; unless the foreign body lies so near as to render its extraction certain, without much pain or difficulty.

If



If a wound be of such a desperate nature as to require amputation, which is frequently the case where it happens in a large joint, it is of the utmost importance to perform the operation immediately; as the consequent pain and inflammation, renders it improper during these symptoms; and, when they are past, the patient is often reduced to so low and weak a state, as to make an amputation a very dangerous and doubtful operation.—Wounds, that border on any considerable artery, are very apt to bleed afresh upon motion, or the return of a free circulation of the blood into the parts; and this is frequently the case when the crust and slough begins to separate,—for which reason one should never attempt to remove it by force, but wait with patience until there is a perfect separation of the slough. The Surgeon in the mean time should be on his guard against this accident of a second hæmorrhage, which is frequently indicated by the patient's complaining of a greater weight and fulness in the limb, attended with more or less pulsation in the wounded part; which latter is an almost infallible sign of the approaching danger, to obviate which, recourse must be had to bleeding and the bark. Mr. Ranby says he has known many instances of persons losing their lives from the bursting of an artery after amputation, and affirms, that in some of the cases, which proved mortal, not above twelve ounces of blood were lost, which appears very extraordinary, and almost unaccount-

able, unless from the previous hæmorrhage, and broken texture of the blood, by which a sudden gush may give such a check to the circulation, as to cause immediate death.—This observation ought to be a lesson of instruction to the young Surgeon, to be particularly attentive in securing every vessel with a proper ligature.—For this reason too, repeated bleedings in the beginning of an inflammation, or rather before it, are attended with such beneficial consequences ; they generally prevent, and always lessen the fever and inflammation, and consequently those impostumations, which generally attend them :—Mild laxative medicines contribute greatly to answer the same purposes,—and to remove the rack of pain, recourse must be had to the sovereign and almost divine power of opium,—next to which, the bark may be added, as a medicine, which Mr. Ranby says, no human eloquence can deck with panegyric proportionable to its virtues. He declares, he has known it procure rest, if given in large doses, when opium had been taken without any effect.—In all large wounds, particularly those made by a cannon ball, there is constantly a laceration of the membranes and exquisitely sensible parts, which are ever attended with excruciating pain, and a great discharge of gleety matter, which if not restrained, proves of the most dangerous consequence ;—under these unhappy circumstances, the bark given in the quantity of a dram every three hours, or oftner  
if

if the stomach will bear it, has a most surprising efficacy in removing these terrible symptoms.

The elixir of vitriol taken three or four times a day in a glass of water, is in these cases of singular benefit, and proves a very good assistant to the virtues of the bark. If the body be costive, a few grains of rhubarb may be added to each dose of the bark, till that inconveniency is removed ;—but on the contrary, if the bark should run off in more than three or four successive stools, its operation that way must be checked by a few drops of the *tinctura thebaica*, or a spoonful of the *Diaferdium* mixture, given in each dose. From what has been said, it is evident, that the bark is one of the best remedies hitherto discovered, for contracting the vessels, and restoring their due action upon the blood, when too great a quantity of that necessary fluid is lost by a profuse hæmorrhage, provided the larger wounded vessels are secured by a proper ligature from future bleeding. It also not only secures the most tender solids and small vessels from being dissolved by the acrimony of any matter absorbed and returned into the whole mass of blood, from large wounds or latent abscesses, but it likewise preserves the texture of the blood itself, from being too much broken, or rendered too watery from the same cause, which would otherwise inevitably produce a fatal, colligative hectic :—But where there is too great a fulness, or too much strength and contractile force in the solids, and an inflammatory tenacity or sizziness in the blood, it may occasion obstructions, pains, inflammations, and their consequences, unless it be timely laid aside, upon the appearance of such effects.

Fractures of the bones of the limbs by a musket ball, are attended with the same general symptoms of other compound fractures, the proper treatment of which, has already been pretty fully explained in the chapter upon that subject; for which reason I need not here repeat what has been there said.

It sometimes happens that two balls pass into a limb, making only one orifice where they entered, and afterwards diverging in their course, form too openings on the opposite side. In such cases, if the two orifices are pretty near each other, they ought to be laid into one, in order to facilitate the discharge of extraneous bodies or matter that may be lodged in the wound.

Where there is reason to suspect, from the course of the ball, that so large an artery is wounded as to occasion a dangerous hæmorrhage; upon the approach of the symptomatic fever, and removal of the eschar, the tourniquet ought to be left loose about the limb, with directions to the patient or some person near him, to tighten it in case of bleeding, until the surgeon comes to his assistance.

When the *os humeri* is fractured, after making the necessary dilatations, and extracting such loose splinters as can safely be disengaged from the muscles, the wound being dressed in the usual way, the bones must be preserved in the most apposite situation by means of the hollow splints recommended in the chapter upon simple fractures, only with this difference, that openings must be made in them opposite to the wound, to admit of the application of the dressings, and afford a free discharge to the matter,



without removing the splints, which would unavoidably excite pain and inflammation, by disturbing the position of the bones.

Monfieur Le Dran, lays it down as a general rule, never to attempt saving the leg, when the bones of the tarsus are fractured by a musket ball ; for as the tendinous and ligamentous structure of the part, does not admit of the necessary dilatations, the consequent fever and inflammation proves fatal in almost every case ; immediate amputation is therefore the most adviseable practice.

A leg or an arm is frequently carried off by a cannon ball, which accident generally leaves the extremities of the bones as well as tendons in so shattered a state, as to render amputation necessary. When this happens to be the case, so much of the limb ought to be preserved, as is consistent with the nature of the injury ; but the operation should always be performed high enough to leave no loose fractured bones above the amputated part.

A complaint of a very singular nature, known by the name of an *Empysemæ*, is sometimes the consequence of a fractured rib, either from blows, falls, or a musket ball passing in an oblique direction, so as to fracture the rib without entering into the cavity of the thorax ; and this complaint is occasioned by small sharp points of the fractured rib, wounding the vesicular part of the substance of the lungs, so as to permit the air to pass into the cavity of the thorax, where being retained, it induces such a degree of difficulty in respiration, by compressing the lobes of the lungs, as sometimes to terminate in an



absolute suffocation. The only remedy, capable of affording effectual relief in so distressing a situation, is, to perform the operation of the *paracentesis thoracis* or opening into the cavity of the chest, through which the confined air may be discharged.-- This opening may be made without much difficulty or danger, by dividing the integument something better than half an inch in length, and then cautiously pursuing the dissection through the intercostal muscles and pleura, with the point of the scalpel.-- There is no danger of wounding the lungs under such circumstances, as they are sufficiently compressed by the air in the chest to keep them out of the way of the knife.

But when the wound made in the pleura by the points of the fractured ribs, is large enough to permit the air to rush freely out of the cavity of the thorax, it passes into the cellular membrane, and sometimes distends it to a monstrous size, extending over great part of the body, face and limbs. The proper remedies in this species of disease, are small scarifications, made with the knife or lancet, into the cellular membrane, and then compressing the integument so as to force out the confined air. Repeated bleeding in both species of Emphysema, and particularly the last, is necessary to relieve the urgency of the symptoms, which are sometimes very severe and oppressive; the emphysematous tumor of the cellular membrane, often lasting several days, before it entirely subsides.

There is so much affinity between wounds made by fire-arms, and burns, that I shall conclude the present subject with a few observations

on the latter.—Burns have generally been considered as a distinct species of sores; and the idea of fire remaining in the burnt part, has given rise to a great many whimsical applications, which the more rational theory of the present Surgery has very rightly rejected.—Superficial burns or scalds, which penetrate no deeper than the cuticle, are most effectually and speedily relieved by the immediate application of spirit of wine. But when they produce vesications, some soft, mild application, such as linseed oil, or a cerate of oil, wax, and spermaceti, are necessary to heal the excoriated parts. When they penetrate still deeper, and the true skin and *membrana adiposa* down to the muscles are affected, and slough away, a different method of treatment is to be made use of. In these last circumstances, where the burn or scald has extended itself over an entire limb, or a large surface of the body, a violent inflammation immediately ensues, attended with most exquisite pain, and sometimes even convulsions.—Bleeding in such cases, according to the age and strength of the patient, must precede every other remedy; the body must be kept open by clysters and gentle purgative medicines, and the parts affected covered with an emollient poultice, and fomented twice a day or oftener, with anodyne fomentations, till the mortified parts begin to slough away, when they may be dressed with some mild digestive, though such an exquisite tenderness affects large burns, that very few ointments are applied, which do not irritate them. One of the most successful I have

ever tried, is the *unguentum e stramonio*, prepared by boiling the leaves of the *stramonium*, or thorn apple in fresh hog's-lard, till the lard will take up no more of the juice ; and then adding as much wax as will give a sufficient degree of consistence to withstand the summer's heat.---This ointment is possessed of an anodyne quality, which renders it the easiest application during the whole state of inflammation, which, with the extreme slowness of the cicatrization, generally lasts long enough to tire both the patient and Surgeon :--- For, where the burn or scald is very extensive, the elongation of the sound skin is produced with great difficulty, and is extremely apt to break open upon the slightest occasion ;-----the ulcer too, by remaining so long open, is very much disposed to shoot out into fungous excrescences, which are with great difficulty kept down by mild escharotics, such as the Roman vitriol, *aq. calcis*, or even lunar caustic and the *pulvis angelicus*,---for dry lint adheres so closely, that you cannot remove it at every dressing, and the fungus shoots up amazingly if not corrected daily by some or other of the escharotics just mentioned, even though you should apply a well adapted roller, which is highly necessary and useful, to prevent this luxuriant growth of flesh, and preserve the parts from unseemingly scars.

A strict regimen is very necessary in these severe cases, which are sometimes so obstinately slow, that a twelve month will elapse before you can entirely heal some of them.

APPENDIX,

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# A P P E N D I X,

*Containing, some short hints on the Structure and  
OEconomy of HOSPITALS; particu-  
larly applied to MILITARY ONES: With the  
general means of preserving HEALTH in an  
ARMY.*

**A**MONG the variety of public errors and abuses, to be met with in human affairs, there is not one perhaps which more loudly calls for a speedy and effectual reformation, than the misapplied benevolence of Hospitals for the sick and wounded.

We daily see persons of every rank and sex, contributing to these charities, with a spirit of liberality, which does honor to humanity; while many of them, with the most becoming zeal, are devoting their time, and sacrificing their private interest to the care of superintending the structure and management of the house; and yet, an absurd mistaken œconomy, has hitherto not only rendered all this pious labour and expence, in a great measure useless, but even fatal and destructive to the very end and aim of the intended purpose, that of healing the diseases of the sick poor.

To those who are unacquainted with the subject in question, it will doubtless appear a very  
O extraordinary

extraordinary assertion that there is not at present in the capital of the kingdom, a single hospital constructed upon proper medical principles; yet it is a fact very generally acknowledged by the most eminent men in the profession of Physic and Surgery in England.

If we enquire into the causes of such glaring absurdities, we shall easily trace them to those sources of darkness and ignorance, from which most of our civil and religious abuses have originated; but how they should be continued to disgrace the improvements of more enlightened times, can only be resolved, by reflecting on the pride, obstinacy and self-interest, which are too generally annexed to ancient errors.

If great and populous cities, have been justly stiled the graves, of the human species; the large and crowded hospitals, generally built in them, may with equal truth and propriety be deemed the lazarrettos or pest-houses of most of the unfortunate persons, who from ill-directed motives of compassion, are carried into these charities. In the two great Hospitals of St. Thomas, and St. Bartholomew, in London, about six hundred patients die annually which is about one in thirteen of those who are admitted as in-patients.

In Paris it is supposed that one third of all who die there, die in Hospitals. The Hotel Dieu, a vast building situated in the middle of that great city, receives about twenty two thousand persons annually, one fifth of which number die every year, --- It is impossible for a  
man



man of any humanity to walk through the long wards of this crowded Hospital, without a mixture of horror and commiseration, at the sad spectacle of misery which presents itself: The beds are placed in triple rows, with four and six patients on each bed; and I have more than once in the morning rounds, found the dead lying with the living; for, notwithstanding the great assiduity and tenderness of the nurses, some of whom are women of family, who take the veil and piously devote themselves to that office; yet it is almost impossible, from the vast number of patients, to bestow timely assistance upon every individual.

If we compare the numbers of patients who die in the county infirmaries of England, with those of the London and Paris Hospitals, the proportional difference will be greatly in favor of the former; \* and although the putrid air of great cities is more unfavourable to health in general, than that of country towns; yet the greatest difference in mortality, will be found, upon a close and fair examination, to arise from the structure and crowded wards of the Hospitals, in over-grown capitals. †

For

\* In the Northampton Infirmary, one in nineteen die annually, and in that of Manchester, placed in a more airy situation, one in twenty two.

† It is to be hoped that the Hospital lately built in the City of New-York, will have fewer objections to its plan, than any Hospital hitherto constructed;—the principal wards, which are to contain no more than eight beds, are thirty six feet in length, twenty four wide, and eighteen high;—they are all well ventilated, not only from the opposite disposition of the windows, but proper openings in the side walls, and the doors open into a long passage or gallery, thoroughly ventilated from north to south.

For, if to the comparison between the mortality in large City-Hospitals, and those of Country Towns, we further add, the proportional difference between the last and that of private practice, it will be found to be in favor of the latter:—From all which facts, it evidently appears, how essentially necessary pure fresh air is, to the cure of diseases in general, and particularly those, which arise from putrescent causes either internal or external.

It is computed that a gallon of air is consumed every minute by a man in health, and much more must be necessary to one who is sick, as the morbid effluvia, which are continually exhaling from all parts of the body and lungs, must contaminate a larger portion of the surrounding atmosphere, and render it less healthful to breathe in; for animals are observed to die much sooner in foul air, than in *vacuo*.

But the preceding facts, not having been sufficiently understood or attended to, a false œconomy has universally prevailed, in the structure of Hospitals for the sick; for those that have hitherto had a principal direction, both in the architecture and management of them, have confined their views entirely to objects of convenience, cheapness, or ornament; and in one of the last Hospitals built in London, for lying-in-women, there is more expence bestowed on an elegant chapel in it, than would have finished four wards.

In short the Physician and Architect, have  
generally

generally two very opposite and incompatible views; the latter laying out his plan so as to contain the greatest number of persons in the least possible space;—whereas the former always aims at having the utmost room which is consistent with use and conveniency.

The same false maxims of œconomy, which have prevailed in the construction of Hospitals in large Cities, are too much adopted in the military Hospitals of Camps and Garrisons, as evidently appears from the complaints made of them, by Sir John Pringle, to whose excellent observations, on the diseases of the Army, I am principally indebted for the few following remarks on the means of preventing diseases in Camp or Garrison.

As changes in the sensible qualities of the air, excesses in diet, and irregularities in exercise, are the principal sources of diseases; so the means made use of to prevent or remove distempers, must be chiefly directed to the three general causes above mentioned.

As the extremes of heat and cold, are pretty severely felt in these northern colonies, and the transitions from one to the other, remarkably sudden, they occasion so large a proportion of American disorders, as to claim the first consideration.

To obviate the effects of intemperate heat during the summer season, the clothing of the troops ought to be lighter than what is generally worn by the British soldiers.—The tanned  
rifle

rifle shirt, over a short linen coat or waistcoat, with sleeves, would be a much cooler and healthier dress to march in during the heat of the summer, than a thick woollen coat, which, by its weight and warmth, promoting excessive sweat, must necessarily exhaust the soldiers strength, the linen dress too is cheaper, and bears washing, no trifling considerations in the clothing of an army.

The marches should always be so ordered, if possible, that the men may come to their ground before the heat of the day; and strict orders should be given, that none of the men should sleep out of their tents, which in fixed encampments may be covered with boughs of trees to shade them from the sun. The usual military exercises too, should be performed before the cool of the morning is over, by which means the fibres will be braced up, and the blood cooled, so as to enable the men to bear excessive heat the better, when it becomes absolutely necessary; and in very hot weather, the centinel duty ought to be shortened.

The preservatives against cold, consists in clothes, bedding and fire: Winter clothing is one of the most expensive articles in a cold country, for which reason, too much attention can hardly be paid to the subject.—Sir John Pringle recommends short flannel waistcoats, which are worn by most of the northern European soldiers, with warm watch-coats for those who are upon centinel duty. It is well known

known from experience, particularly in many parts of New England, that a flannel waistcoat or shirt, worn next to the skin, will keep a man much warmer than nearly double the quantity of covering over a linen shirt, and consequently a very great saving might be made in this part of a soldier's dress.-----The watch-coats for centinel duty, may be made of coarse furs, which in dry frosty weather, are preferable to cloth, and Indian shoes or Mockasins, under the same circumstances, are much warmer than common leather ones, which, however, ought to be provided with firm thick soles, to keep the feet dry when the ground is wet.

The next means of preservation mentioned, was bedding ; by which, according to Sir John Pringle, is understood, a blanket to every tent of the infantry ; but in this climate, if a blanket was allowed to every soldier, particularly at the beginning and end of a campaign, the advantages accruing to the service, by preserving the health of the men, would infinitely more than counterbalance the expence.

As to fuel, a soldier ought to be allowed as much as will serve to dress his victuals, keep his barrack dry, to moderate, rigorous frost--but in general warm clothing and exercise, are the best preservatives against cold.

To prevent the ill effects of moisture in camps, trenches should be made around the tents to carry off the water, and it is of great importance to allow the soldiers plenty of straw,  
and



and to have it frequently changed. But in fixed camps, where a large quantity cannot easily be procured, mattresses made of straw or corn husks, might possibly be substituted for it, without much expence; and this kind of bedding, would admit of being constantly aired, and even washed and dried again, in good weather.—If a soldier's bedding could be raised to a small height from the ground, particularly in damp situations, it would certainly contribute much to the preservation of his health, the tents should be well opened and aired every day when the weather will allow it.

The wearing of wet clothes is a common source of a great many complaints, for which reason, as marches and out-duty necessarily expose the men to rain, they ought to be allowed fires in the rear of the camp, to dry their clothing, an indulgence which has been found to be of great benefit.

To obviate the effects of putrid air, arising from marshes and stagnating waters, the encampments should be frequently changed; but if this is incompatible with the nature of the service, other means must be substituted, to preserve as much purity of air as is possible under such circumstances, particularly during the dysenteric season, when the putrid effluvia arising from the discharges of the sick, combined with those already mentioned, render the air of a camp almost pestilential.

For this reason no soldier should be permitted  
to

to ease himself any where about the camp, except in the privies, under the forfeiture of some slight but strictly inflicted penalty; and upon the first appearance of a spreading flux, the privies should be made deeper than usual, and once a day a thick layer of earth thrown into them, till the pits are near full, when they should be well covered and supplied by others: It will also be a proper caution; to order the privies to be made either in the front or rear of the camp, according to the usual stationary winds, which will carry off the putrid effluvia, without proving offensive or noxious. The straw too, and bedding, ought to be more frequently changed and aired, at such times, than is usual.

When the dysentery begins to be frequent in camp, the sick should never be sent to one general Hospital; the consequences of which, after the battle of Dettingen, were so fatal, that the whole village of Feckenheim, where the Hospital was fixed, received the distemper, and the air became at last so vitiated and contagious, from the numbers of sick and wounded crowded together, as to generate the jail or hospital fever; which combined with the dysentery, became a perfect plague, and swept off the Apothecaries, nurses, and attendants, equally with the patients who were brought in;—at the same time; those who remained sick in the camp though they wanted many of the conveniencies and necessities found in the Hospitals, suffered only

the original diseases, and generally recovered.

For this reason, when the dysentery prevails, Sir John Pringle advises the slighter cases to be treated by the regimental Surgeons in camp, while the rest, or as many as can be attended by the same Surgeons, should be put into regimental Hospitals, the situation of which, ought to be as dry and as airy as possible. The buildings too, appropriated to such purposes, should be the most spacious that can be found; for which reason, churches, barns, and every kind of large out-houses, are preferable to close private dwellings; for as the greatest danger arises from foul air, it can never be compensated by diet or medicine.

As these regimental Hospitals are of the greatest consequence, they ought to be supplied with blankets and medicines from the public stores, with an allowance to nurses, and other necessaries. And to enable the regimental Surgeons to pay more attention to the sick, an additional mate should be added to each regiment; for in sickly seasons, one or both mates may fall ill at once; and it is then impossible for the Surgeon to do his duty.

As to the disposition of Hospitals, with regard to preserving the purity of air, the best rule is, to admit so few patients into each ward, that a person unacquainted with the danger of bad air, might imagine there was room to take in triple the number.—When the ceilings are low,

low, it will be a good expedient, to remove some part of them, and to open the garret story to the roof; for Sir John Pringle says, it is incredible in how few days the air will be corrupted in thronged and close wards; and what makes it harder to remedy the evil, is, the impossibility of convincing the nurses, or even the sick themselves, of the necessity of opening the doors, or windows, at any time, for the admission of air.

The sick or wounded should by no means be put into common rooms, without fire-places; as by that means, the foul air is confined, and increased to a ten-fold degree; nor will the usual ventilators, answer the purpose of correcting or expelling the putrid effluvia.

Lastly, the utmost possible cleanliness is to be observed, both in the persons and bedding of the sick, whose discharges and dressings, should be removed immediately out of the wards; and the floors, after being properly cleaned, may be sprinkled with vinegar, of which a large quantity should be allowed to every Hospital.

With respect to those diseases which arise from improper diet, Sir John Pringle observes, that no orders will restrain soldiers from eating and drinking what they like, while they have money to purchase it; and the only way to prevent excesses, will be to oblige the men to eat in messes; by which means, the best part of their pay will be bestowed on wholesome food, the  
choice

choice of which may be left to their taste, as most men commit more errors in the quantity, than quality of their food.

Pork has been sometimes forbidden in camps, being regarded as unwholesome. Sanctorius says, it retards perspiration, and as it corrupts sooner than beef or mutton, it may be presumed to afford less proper nourishment, where there is any tendency to putrefaction.——

However, it certainly constitutes more than one half of the animal food consumed by the American peasantry, and when mixed with vegetables, is found to be a very nourishing and wholesome diet. It may not be amiss to observe, that fat meats are so much more nutritive than lean ones, that two ounces of suet, will afford more nourishment, than eight or ten of lean meat; and consequently in long marches, through uninhabited countries, a soldier's provision, might be rendered much lighter, by taking only suet or fat pork with his biscuit.

As to spiritous liquors, though the excess of them is undoubtedly pernicious, yet something stronger than water or small beer is necessary, for men who are exposed to all the extremes of heat and cold, to long marches and wet clothes; for which reason, a moderate quantity of spirits may be allowed with great propriety; and if, during the heats of summer, the allowance of rum was mixed with vinegar, it would make a good antiseptic drink, and serve to correct in  
some



some measure, the natural tendency of the humours to corruption, at that season.

With respect to the means of preventing diseases, arising from errors in exercise, they may be confined to the two opposite extremes, of indolence and fatigue.—When the service requires it, every fatigue must be endured; yet, in general, there is less danger from excesses in the latter than the former, particularly if good provisions and dry straw are to be procured.

In fixed camps, the exercise of a soldier may be considered under three heads;---the first relates to his duty, the second, to his living more commodiously, and the third, to his diversions.

The first, consisting chiefly in the exercise of his arms, will be no less the means of his preserving health, than of making him expert in his duty; and frequent returns of this, early and before the sun grows hot, will be more advantageous, than repeating it seldom, and staying out too long at a time; for a camp affording little conveniency for refreshment, all unnecessary fatigue is to be avoided.

As to the second article, cutting boughs for shading the tents, making trenches round them for carrying off the water, airing the straw, cleaning their clothes and accoutrements, and assisting in the business of the mess, are all, things, which, as they must be strictly executed by orders, ought to be no disagreeable exercise to the men, for some part of the day.

Lastly,

Lastly, as to diversions, since nothing of that sort can be enforced by orders, the men must be encouraged to them by the example of their officers, or by small premiums to those who shall excel in any kind of sports, which shall be judged most proper for answering this purpose: But, herein some caution is necessary, with regard to excess, because our common people observe no medium between their love of ease, and pursuing the most violent exercise; and however necessary, motion may be to troops, in fixed camps, we are to beware of giving them too much fatigue, especially in hot weather, and in times of sickness; and above all in exposing them to wet clothes, which, as it has been already observed, are the most common causes of camp diseases.

F I N I S.

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